P. Soliniac

Peking. 1936.

Оля!

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учебники по алгебре.

I Тетрадь для 8-9-10 кл.

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VII Грамматику Грузинской

Все это найдешь в моем портфеле.

Также нужно мыло для бритвы, кашку и помазок.

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MY FLIGHT ACROSS ANTARCTICA

BY LINCOLN ELLSWORTH

ONE day recently, while I was in Atlantic City doing some writing, the elevator man in my hotel remarked to me, "It must be mighty quiet down there around the South Pole."

"Yes," I replied, "it is. That's why I like it."

"I am a sort of poet myself," he answered.

Several weeks later he sent me the manuscript of some of his poems, asking if I would write a foreword to them. Idealists and dreamers, perhaps, most explorers are.

After the flight I made with Amundsen in 1926 from Spitsbergen over the North Polar Basin, restlessness beset me.* Desire nagged me continually until I was able to settle on the last great adventure of South Polar exploration—the crossing of Antarctica.

I made three trips to the Far South to accomplish this aim.

TWO MAJOR GEOGRAPHIC QUESTIONS

I hoped to span the 1,700 miles of continental ice that separates the Ross Sea on one side from the Weddell Sea on the other, because two major geographic problems remained to be solved there (map, page 4).

The questions were these:

Did the highlands of the Antarctic Archipelago on the Weddell Sea side continue on across Antarctica to join the mountains of South Victoria Land on the Ross Sea side?

Or, did this southern continent consist of at least two great land masses cut by a channel joining the Ross Sea and the Weddell Sea? (Page 35.)

* "Navigating the *Norge* from Rome to the North Pole and Beyond," by General Umberto Nobile, NATIONAL GEOGRAPHIC MAGAZINE, August 1927.

My plan for the first expedition in 1933 was to fly from the Bay of Whales on the Ross Sea to the Weddell Sea and back.

My base ship—a staunch, single-deck, motor-driven vessel of 400 tons—I bought in Norway. She was built in 1919 of Norwegian pine and oak, and had served as a herring boat until I sheathed her with oak and armor plate for an icebreaker. Her engine was a semi-Diesel type. She could do seven to eight knots, and had a cruising radius of 11,000 miles.

I named this little ship the *Wyatt Earp* for the unbelievably brave frontier marshal of Dodge City and Tombstone, who, more than any other man of his time, perhaps, typified the pioneer empire builders of the West.

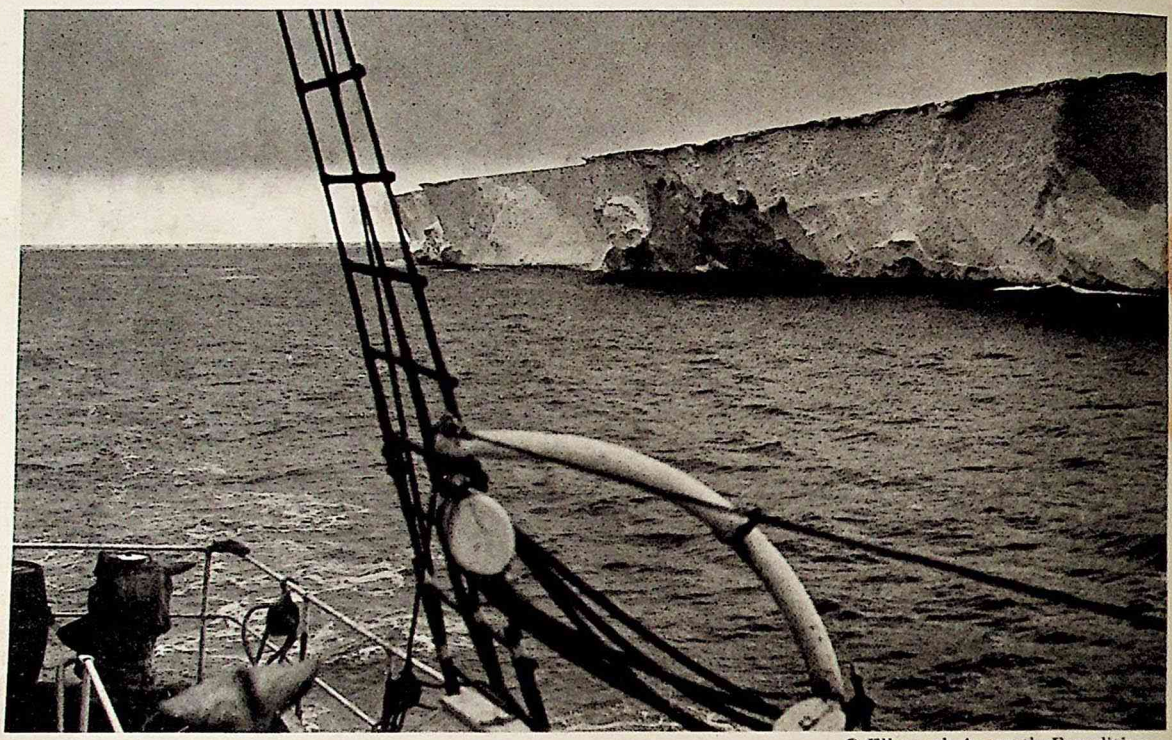
THE FIRST EXPEDITION

Our first expedition reached Dunedin, New Zealand, November 9, 1933.

After a month of refueling and refitting, we started south and spent 22 days pushing through the ice pack into the open water of the Ross Sea. We reached the Bay of Whales January 9, 1934, and unloaded my airplane on the bay ice.

The *Polar Star* was a Northrup all-metal, low-wing monoplane, 31 feet long, with a span of 48 feet, built in California, and designed especially for my flight in Antarctica. It was fitted with a 600-horsepower Wasp motor.

Loaded to its capacity with gasoline, this plane would have a cruising radius of more than 5,000 miles. Thus three essentials for flying in the Antarctic were emphasized: large cruising radius, high top speed (230



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THE "WYATT EARP" SKIRTS ALONG THE BARRIER, STARTING POINT AND GOAL OF MANY ANTARCTIC EXPEDITIONS

On the ship's arrival at the Bay of Whales, January 9, 1934, for Ellsworth's first attempt to fly across Antarctica, an iceblink on the horizon (left) indicated that the ice face stretched on and on. A milky-white sky, such as that shown here, denotes ice and snow beneath, whereas a slate-colored water sky signifies open water. The width of the band, or blink, gives a scale to estimate the distance of the ice or open water from the beholder.

miles per hour), and low wings, so that the plane, after landing on the snow, could have its skis sunk and its wings lowered to the surface. Thus the wind could not get under them.

A unique feature of the plane was the flaps, which permitted it to land at less than 50 miles an hour.

We made a trial flight three days after our arrival and landed again on the bay ice. Heavy seas lashed the ice front, so we moved the plane a mile inland from the ship.

Then came disaster. The ice broke up for five miles inland from the ship, an occurrence unprecedented at this season, so far as records show.

In the break-up the plane was strained out of alignment and the skis crushed between moving ice cakes, so that flying it would be unsafe. There was nothing to do but end our expedition for the year and take the *Polar Star* back to the factory in America for repairs.

By the middle of the following September, 1934, the plane and I and my companions were back in New Zealand, ready for another try. This time I decided to make the flight in the other direction, from Weddell Sea to Ross Sea, because on the Weddell Sea side we could get to a flying base at least a month earlier. We first landed on Deception Island, in the northern part of the Antarctic Archipelago; but the snow on our runway melted before we could get the plane ready for flying.

OFF FOR THE SECOND ATTEMPT

While waiting here, we passed part of our time collecting penguin eggs.

You can't just take the eggs. You must leave your hat or a rock, or something, in the nest for the mother to sit on. As long as she feels something under her, she is content. Otherwise, she comes after you with her stubby wings and they are strong enough to break your ankle!

We caught two of the Adélie penguins and took them aboard our ship. One was



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ELLSWORTH PLAYS HOST TO A SAUCY LITTLE "NEIGHBOR" IN ANTARCTICA

While waiting for a break in the weather at Deception Island on the second expedition in 1934, some of the men collected penguin eggs and caught several of the birds and took them on shipboard. These Adélies are among the few creatures living on the ice-covered lands of the far south.

captured by putting a coal sack over his head. We dirtied his white "shirt front," and this apparently made him feel bad, for he sulked all the time he was on board.

When the disappearance of the snow made a flight from Deception Island impossible, we turned the *Wyatt Earp* south to find another take-off field and cruised down the west coast of the Antarctic Archipelago. I have never seen finer scenery anywhere in the world than this coast (p. 15).

After a search of 44 days on both coasts we selected Snow Hill Island (page 4).

On this island we found fossils in the bleak, bare ground—fossils of creatures related to crawfish, oysters and clams, and various forms of crustacea, which were perhaps 100 million years old (page 8). They indicate that at one time the vast frozen expanse which now is Antarctica was a temperate land, and had a warm climate. We even found fossils of wood that are related to the Sequoia trees in California.

NORDENSKJÖLD CABIN FOUND INTACT

It was upon Snow Hill Island that Dr. Otto Nordenskjöld established his headquarters and built a cabin where he spent the winters of 1902 and 1903. The cabin is still intact and the human warmth that once made its interior hospitable is today replaced by a huge block of sea-blue ice.

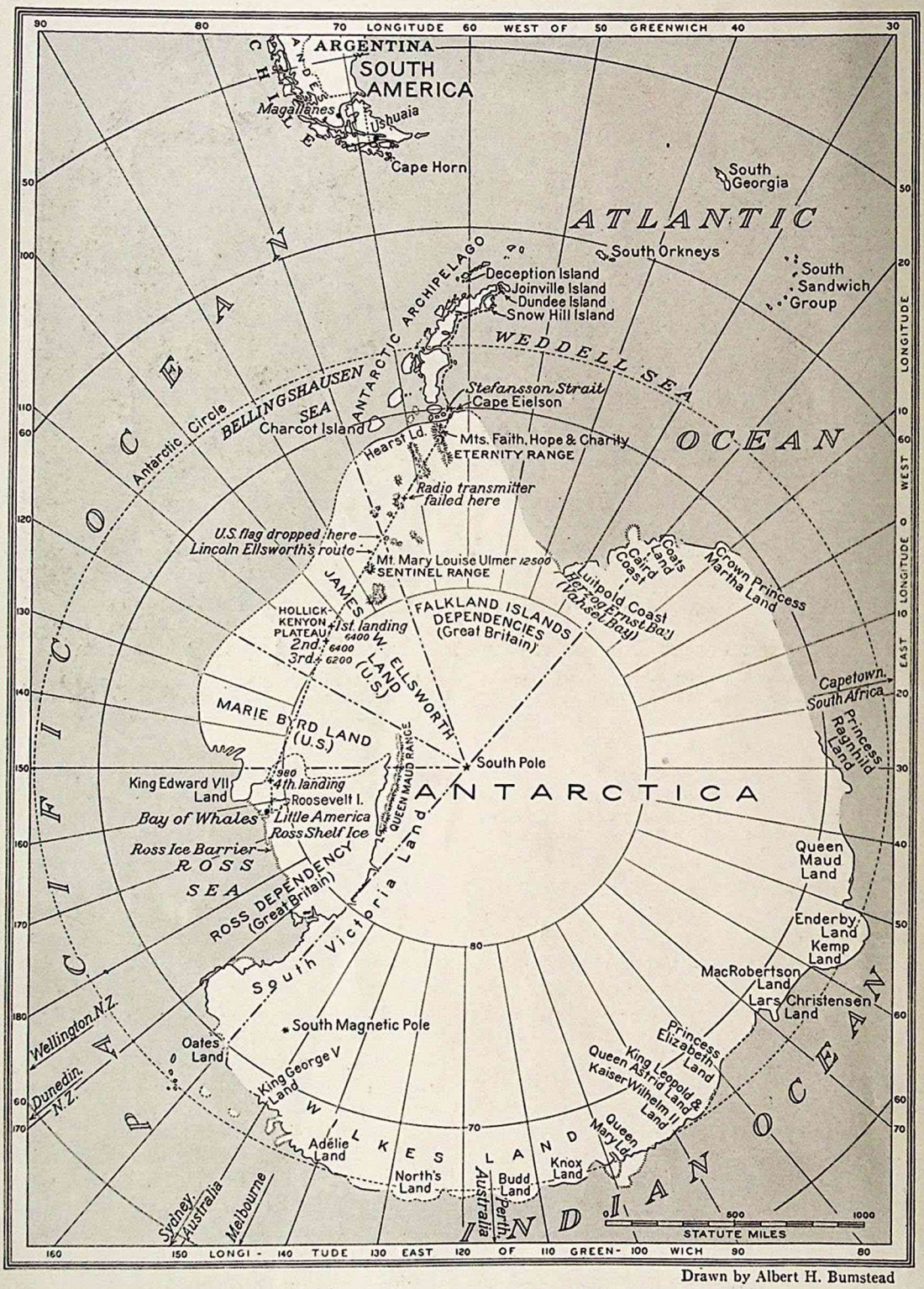
We were undoubtedly the first humans to visit it since he left it so hurriedly. The four corners were guyed with steel cables to withstand the 90-mile gales which he recorded there.

The ground round about showed the helter-skelter scene enacted there 33 years ago, after Nordenskjöld's ship had been crushed, when the men rushed to catch the rescue ship before the ice should close in upon them for the third season.

The mummified bodies of three white sledge dogs lay in front of the cabin, just where they had been shot. A pair of ice skates lay near the door; and a pair of boot trees. Against the cabin were several boxes of cans of sardines, pepper and mustard, and cakes of chocolate.

The chocolate tasted all right, but the thought of fish of a vintage of 33 years ago was too much for us.

The Swedish expedition led by Dr. Otto



Drawn by Albert H. Bumstead

ELLSWORTH'S FLIGHT BRIDGED ANTARCTICA FOR THE FIRST TIME

North is not just at the top of this map, as is usually the case, but all around its four sides! South is in the center at the South Pole. The *Polar Star* followed a straight course from Cape Eielson to Little America, yet it was headed southwest at the start and west-northwest at the end. Roughly circular, and nearly filling the Antarctic Circle, this vast ice-covered continent of some 5,000,000 square miles is larger than Europe, yet it has no permanent population! The huge pie-shaped territory claimed for the United States by the author was named for his father, James W. Ellsworth Land.



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COLLECTING PENGUIN EGGS FOR THE SHIP'S MESS

Give an Adélie a stone in its nest in place of an egg and it makes no protest. But take the egg without substitution and the bird flies into a rage, thumping the intruder with its short stubby wings. "The eggs are delicious when made into omelets, but ye gods, when they are boiled! Then they are like rubber balls, and fishy besides" (page 7).

Nordenskjöld was one of the most adventurous and successful that ever went into the Antarctic, for it was the geological work of Nordenskjöld and J. Gunnar Andersson which showed why the highlands of the Antarctic Archipelago must be considered a continuation of the South American Andes.

Weather proved our stumbling block on our second expedition. In the two months we were there we had only 12 continuous hours of cloudless sky.

On January 3, 1935, the weather cleared and we hurriedly got the *Polar Star* into the air. This was our last chance because it was so late in the season.

We flew southward toward the mainland of Antarctica, but soon the clouds closed in and snow squalls appeared ahead. We spent several hours mapping the Antarctic Archipelago and returned to our base.

Thus the weather defeated us for one more year. So we turned north and returned home by way of South America.

On our way home from our second expedition we had noticed Dundee Island, north of Snow Hill Island, and decided that it might be a better base for our next flight. So we landed, in November, 1935, on this island, 500 miles farther south than Cape Horn, and separated from it by the stormiest ocean in the world.

PLANE TRAVELS 48,000 MILES FOR A 20-HOUR FLIGHT

The *Wyatt Earp* had carried me and my plane in the last three years 48,000 miles in search of a suitable taking-off ground for our 20-hour flight across Antarctica.

A good-natured friend had remarked to me when he bade me farewell in New York, "Your *Polar Star* has traveled farther and flown less than any other plane!"

In addition to my pilot and myself, oil



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A GIANT FOOT AND ITS BROKEN SHIN

A landing ski and its attachment post, crushed when the *Polar Star* was caught in the ice break-up at Bay of Whales, January 13, 1934. The plane is on the *Wyatt Earp* ready for the long voyage back to America for repairs (page 2).

and gas, we were to carry on the airplane food, a hand sledge with cover and lashings, tent, food box, primus stove, one snow shovel, snow knife, two pairs of snowshoes, and also a radio trail set and a portable generator, reindeer-hide sleeping bags, and photographic equipment.

Our food consisted of pemmican, wheat biscuits, sugar, bouillon cubes, bacon, oatmeal, butter, powdered milk, dried apricots. We had three months' emergency rations in sacks and tins.

Our radio equipment was constructed to transmit on any wave length between 20 and 80 meters. The power output was 100 watts and it was intended throughout the progress of our flight that the *Wyatt Earp* should receive news which could be relayed to New York. We also had an emergency transmitter and receiver which could be carried on the trail.

Our total weight was 7,789 pounds; our gasoline alone weighed 2,796 pounds.

In our party on shipboard were 17 men, six of whom stuck through all three expeditions: Sir Hubert Wilkins, without whose assistance the flight could never have been made; Lanz, the radio operator; Captain Olsen, of the *Wyatt Earp;* Liavaag, the first mate; Chief Engineer Holmboe; and Larsen, the cabin boy. Money could not buy such loyalty as theirs.

"THE QUIETEST MAN I EVER KNEW"

I was fortunate in obtaining for pilot of the *Polar Star* Herbert Hollick-Kenyon, of the Canadian Airways. Kenyon already had varied experience flying under subarctic conditions of northern Canada. He was a fine fellow, a grand pilot, and the quietest man I ever knew.

We had planned to make the 2,300-mile flight along the Antarctic Archipelago and across the continent to the Bay of Whales on the Ross Sea in 14 hours, but it took us just 22 days to get across.

It was conceivable that the flight could be made in 14 hours. Our actual flying time was not badly estimated, for we were in the air only 20 hours and 15 minutes. The rest of the 22 days was spent in overcoming the odds which that area provides with inconsiderate abundance.

A short distance away from where the plane was moored on the shelf ice of Dundee Island was an Adélie penguin rookery. Members of our party gathered the eggs in a bucket for the ship's mess. Penguin eggs are delicious when made into omelets, but ye gods, when they are boiled! Then they are like rubber balls, and fishy besides (page 5). My first experience with these eggs was when they were boiled. Consequently, I have never since been able to eat them in any form.

TURNED BACK AGAIN—WITHIN SIGHT OF THE UNKNOWN

We took off in perfect weather November 21 for what we supposed was to be our flight across the continent. We were going along beautifully. I was elated.

Then, after we had flown almost 600 miles, just after crossing Stefansson Strait, which separated the known from the unknown, the celluloid in a fuel gauge bulged and was in imminent danger of bursting in Kenyon's face. If we landed where we were to repair the defective part, there was a question whether we could take off again with our heavy load and make altitude.

There, just ahead, lay a great unknown mountain range, with peaks rising majestically to 12,000 feet. These had never before been seen by the eye of man. I had lived for this moment. Only one who has known intense anticipation of some great event can imagine the depth of my despair at being forced back after coming so far along the path to victory.

After 10½ hours of flying, we landed back at Dundee Island to make preparations anew. Weary hours the crew worked cheerfully, again hauling gas to the hilltop, checking the engine and repairing the gauge. No one complained. Work and anxiety are inevitable parts of exploration.

While the men labored with the plane, I worked out new navigation graphs based on an 8-o'clock (G. C. T.)* start for the following morning.

* Greenwich Civil Time is referred to throughout this article.

This year we had no meteorologists with us, for I was convinced that the only way to make this flight was to start off when it was clear, be prepared to land in case of bad weather ahead, and to camp until conditions again were favorable for flying.

Although on November 22 the weather promised to remain clear, I had grown distrustful and scarcely drew a free breath until 3 a. m. the next day, when Hollick-Kenyon and I were called and told the weather was clear.

We ate a hearty breakfast, then dressed in heavy clothing. We wore snowshoes and purposely made slow time walking the five miles to the plane because we did not wish to dampen our clothing with perspiration before taking off. After two hours we reached the place where the *Polar Star* lay groomed, ready for flight.

As Kenyon busied himself with last adjustments, I had only one thought: "This time we must make it!" There was a finality about it all I had not experienced before. Subconsciously I heard the whir of the propeller and mechanically noted 8:05 o'clock as we took off to the south in renewed pursuit of the unknown (page 14).

Weddell Sea was quite open for the first 300 miles, an unusual phenomenon in the Antarctic springtime.

For 600 miles we flew along the eastern coast of the Antarctic Archipelago, previously explored by Wilkins, until we came to the frozen channel which we identified as Stefansson Strait, named by Wilkins.

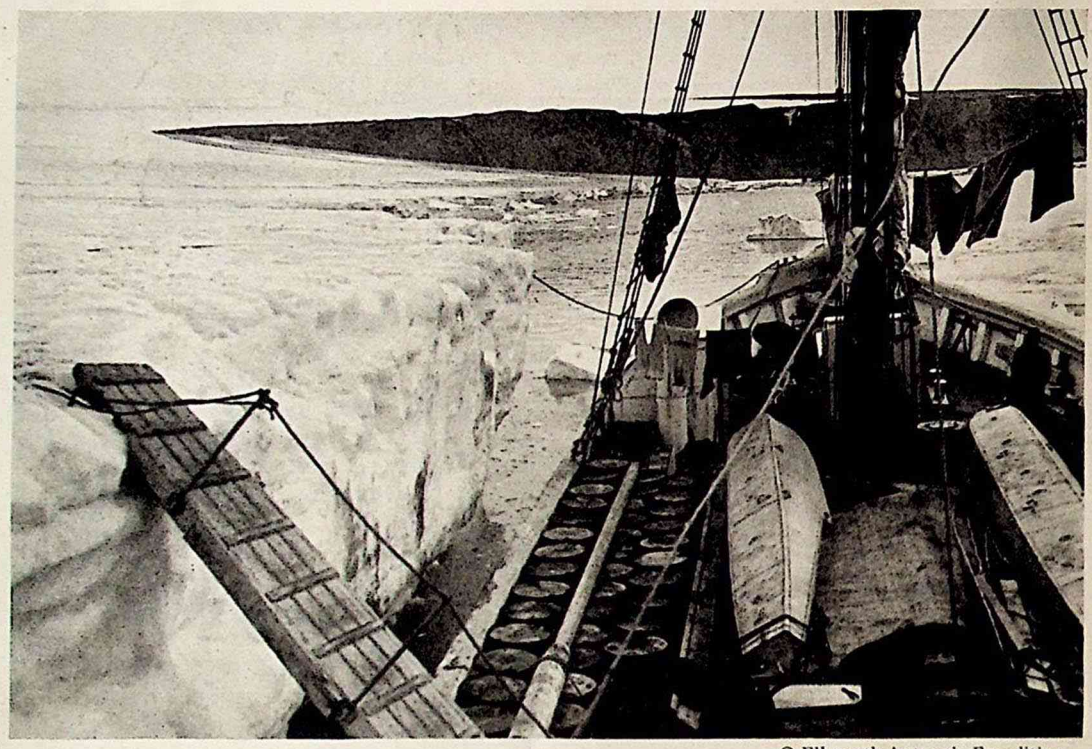
This strait appeared to be not more than three miles wide, which is much narrower than it is shown on the maps. We could not see far enough to determine whether it actually connected Weddell Sea and Bellingshausen Sea, or was merely a deep fiord.

At 12:22 we crossed Stefansson Strait and took compass bearings of the continental coast. The low, black, conical peaks of Cape Eielson rose conspicuously out of a mantle of white on our left.

OVER THE UNKNOWN—AT LAST!

We climbed to 13,000 feet, where the temperature was 10 degrees, Fahrenheit. We were now over the unknown.

It falls to the lot of few men to view land not previously seen by human eyes. It was with a feeling of keen curiosity and awe that we gazed ahead at the great mountain range which we were to cross. Bold and rugged peaks, bare of snow, rose



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SNOW HILL ISLAND, WHERE THE WEATHER WAS ALWAYS BAD!

The low ice face made it possible to land the *Polar Star* here on the second expedition. A two months' wait gave only 12 continuous hours of cloudless sky. Fossils were found in the bleak area beyond.

sheer to some 12,000 feet above sea level.

Again I felt a supreme happiness for my share in the opportunity to unveil the last continent in human history.

We were indeed the first intruding mortals in this age-old land, and, looking down on the rugged peaks, I thought of eternity and man's insignificance. So these first new mountains we saw I named Eternity Range (pages 16 and 17). The three most prominent peaks on our right I named Faith, Hope, and Charity, because we had to have faith, and we hoped for charity in the midst of cold hospitality.

In striking contrast to these rugged mountains were the flat, low peaks of the Antarctic Archipelago we had followed south—peaks which dwindled down into low isolated nunataks as they neared Stefansson Strait. Undoubtedly both ranges are of sedimentary origin. I wondered whether valuable coal deposits might one day be unearthed here.

The range which we now were crossing was a loosely formed one, with none of the crowded topography of peaks with glacier-filled valleys and highly crevassed bottoms, such as the Queen Maud Range shows. We saw neither glaciers nor crevassed surfaces in this part of our crossing.

We fully realized that this was the most dangerous area of our flight, for on one side lay the frozen Weddell Sea, which no ship could penetrate, and on the other an unknown continent larger than the United States and Mexico.

On we went, the mighty panorama of the vast Antarctic Continent unrolling before our eyes. On and on, for three hours more, and the mountains beneath us gave place to a vast polar ice plateau from which emerged a few nunataks, the last evidence of the mountain chain just passed. We were flying at 10,000 feet above sea level, which was the average altitude of our flight.

At 4:15 o'clock, when we had traversed 1,000 miles, and were yet 1,300 miles from the Bay of Whales, the radio broke down because of a defective switch and antenna lead. Not hearing from us, the world began to worry, as we learned later.

At that instant on the distant right horizon we sighted a mountain range with isolated black peaks, which soon faded out.



© Ellsworth Antarctic Expedition

DUNDEE ISLAND'S HAIR SEALS HAD NO FEAR OF MAN

The creatures apparently had never before been disturbed and, like dogs, seemed to enjoy having their sides scratched.

After 45 minutes more a few additional peaks showed on the same skyline, and in another 25 minutes more mountains 120 to 140 miles away appeared on our left horizon; also a few peaks to the right.

PEAK NAMED FOR MRS. ELLSWORTH

Half an hour passed and it became very hazy ahead; below it was dead flat, with a patch of sastrugi (frozen windrows of snow) on our left.

One hundred and ten miles farther on, again as we looked to the left, we came abeam of a solitary little range to which I took bearings.

It was symmetrically formed with a central pyramid rising to 13,000 feet and dwindling down at either extremity to merge into the surrounding plain. I named it Sentinel Range and its central peak Mount Mary Louise Ulmer, for my wife, whose unfailing help was a bulwark of support (page 18).

Fifteen minutes later, on the south horizon and 100 miles distant, appeared a long, black, flat-topped range which visibly extended through at least one degree of latitude. This appeared to be the last of the mountains we were to see, for ahead and around swept only a vast plateau meeting the horizon in an expanse of white.

Throughout the journey so far visibility had been from 120 to 150 miles.

For two hours we flew on, with nothing ahead to break the monotony of the level ice plain stretching out beneath. We had been in the air nearly 14 hours, flying at about 112 miles per hour. Visibility began to get poor because of clouds ahead. We determined to land and take an observation, for we had no gas to spare.

CAMPING 1,800 MILES FROM NEAREST SETTLEMENT

This was the first of four landings during the crossing and we passed 12 hours of our 19 hours here taking observations to check our position.

The snow on the high plateau was granular and packed so hard that the skis of the plane made little impression. The surface elevation at our first landing place was 6,400 feet, and the plateau extended with slight undulations in all directions.



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ALL THAT PROJECTS ABOVE THE SURFACE WHEN A BLIZZARD ENGULFS THE "POLAR STAR" IS THE SNOW-CHOKED ENGINE

Here is striking evidence of how the weather defeated the second expedition. Two members take advantage of the hard, smooth surface to ski down the steep slope above the camp on Deception Island. It seemed a hopeless task shoveling out the snow from around the plane. First storms, then melting snow on the take-off field, and continually cloudy skies made it impossible to start the transcontinental flight (page 5).



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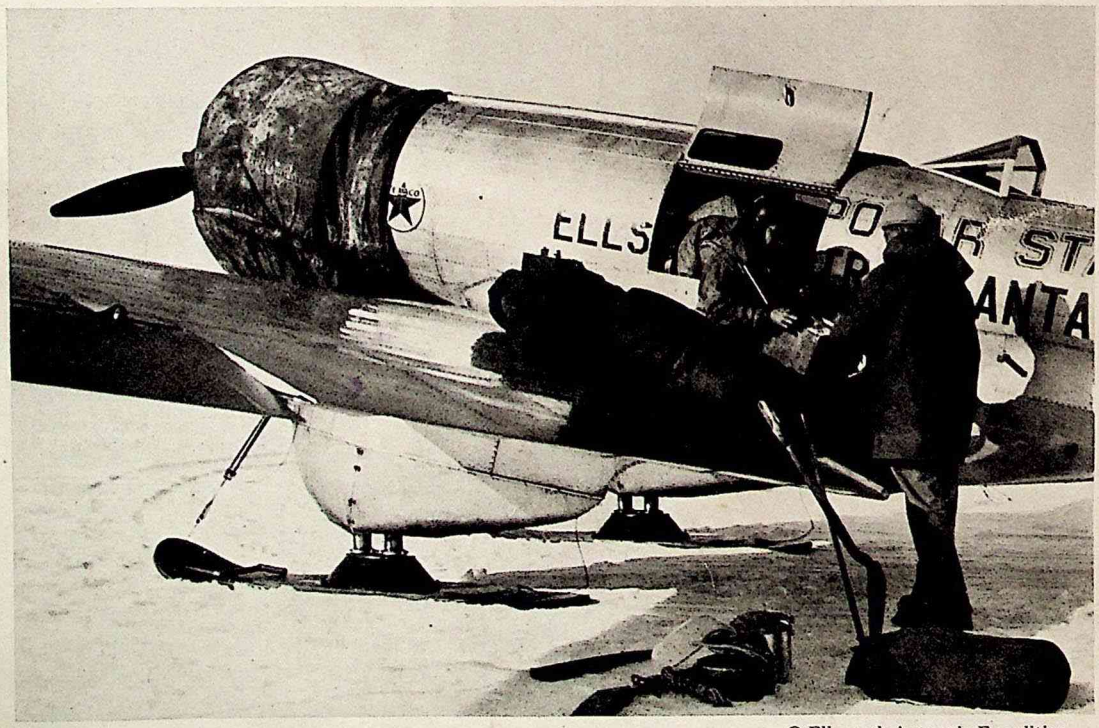
NOSING THROUGH DRIFT ICE, THE "WYATT EARP" STEAMS ALONG THE ANTARCTIC ARCHIPELAGO IN QUEST OF A SNOW TAKE-OFF FIELD



© Ellsworth Antarctic Expedition

TO ENTER THIS TENT ON THE ICE ONE MUST CRAWL ON ALL FOURS

Ellsworth demonstrates the "bellows sleeve entrance" which kept snow and wind from getting inside. The sleeve also made it awkward for the explorers to enter (page 20). The floor cloth of the tent was sewed to the sides and ends, also to exclude wind and snow. The picture, taken on Dundee Island the day preceding the final take-off, shows Hollick-Kenyon on the left.



© Ellsworth Antarctic Expedition

SHIPPING CARGO FOR THE UNKNOWN

On the wing of the *Polar Star* are the reindeer sleeping bags of Lincoln Ellsworth and Herbert Hollick-Kenyon. The box contains a primus stove which burns vaporized gasoline, and several days' rations. Stored in the airplane are three months' emergency rations. Since the skis were not stream-lined, they slowed the normal cruising speed, 150 miles per hour, to about 116.



© Ellsworth Antarctic Expedition

HERE "OLD GLORY" WAS FLOWN OVER THE EARTH'S LAST UNCLAIMED LAND

The photograph was taken after the flyers had made their first landing on the Antarctic plateau, November 23, 1935, in latitude 79° 12′ South, longitude 104° 10′ West, and had set up their tent. By raising the Stars and Stripes Ellsworth established a claim for the United States to a wedge-shaped area extending between the 80th and the 120th meridians west of Greenwich, and from the coast to the South Pole (see map, page 4). The surface elevation at this camp was 6,400 feet, and the plateau extended with slight undulations in all directions.

We climbed out of the plane rather stiffly and stood looking around in the heart of the Antarctic.

There we were—two lone human beings in the midst of an ice-capped continent two-thirds the size of North America. Perhaps this thought brought us closer together.

AMERICAN FLAG RAISED OVER VAST AREA

Suddenly I noted the fuselage was crumpled. Kenyon thought it must have been done on the take-off, but I had been writing my notes and had felt no jar then. Now I recalled that when we came down here I thought my teeth would go through the top of my head.

We had been flying for 14 hours, and, as we landed, there was a slight haze underneath. Besides, there was the uncertainty about what kind of landing surface we might find.

We fixed our position at latitude 79° 12′ S., longitude 104° 10′ W. We found we were 45 miles off our course.

The Pole lay 750 miles south of us, Dundee Island 1,550 miles behind us, the coast line of the continent several hundred miles to the north, and the Bay of Whales 750 miles ahead. It was here that I raised the American flag over the last unclaimed land on earth, comprising about 350,000 square miles. This area, extending from longitude 80° to 120° W. and from the coast line to the Pole, I named James W. Ellsworth Land, for my father.

That part of the plateau above 6,000 feet I called Hollick-Kenyon Plateau, for my pilot.

We set up our balloon-silk tent and took repeated observations, which consisted of shooting the sun with a sextant and getting the exact Greenwich time, then going into the tent and, with our tables and Nautical Almanac, working out our position.

After getting one position line, it was necessary to wait at least three hours to get another line crossing it at an angle sufficiently sharp to determine our exact location.



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FAREWELL TO DUNDEE ISLAND—ON SLOPING ICE THAT GAVE A TRICKY TAKE-OFF FOR THE TRANSCONTINENTAL FLIGHT

The photograph, taken at 8:05 Greenwich Civil Time, November 23, 1935, shows the ground party's last view of the *Polar Star,* as it roared down the snow field.



© Ellsworth Antarctic Expedition

READY FOR HER FLIGHT ACROSS ANTARCTICA, THE "POLAR STAR" RESTS ON SNOW-COVERED DUNDEE ISLAND

Below the wing is the canvas hood enclosing a fire pot for heating the engine (page 21). In the emergency tent mechanics warm themselves. Over the left wing the ship *Wyatt Earp,* moored to the ice face, seems dwarfed by the peak of Joinville Island.



© Ellsworth Antarctic Expedition

SOME OF THE WORLD'S FINEST SCENERY—BUT SELDOM A HUMAN EYE TO SEE IT!

Among the large and small islands of the Antarctic Archipelago, black rocks protrude from their mantles of snow and ice. The cliffs of ice facing the sea make it impossible to land a plane along most of this coast. The sheer ice walls shown here on the Bellingshausen Sea side are approximately 300 feet high.



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THE FRINGES OF ETERNITY

These peaks of the Eternity Range were photographed two and a half hours after the *Polar Star* crossed Stefansson Strait. Thirty-seven minutes later this great mountain range dwindled into isolated nunataks, which gave way to the level Antarctic plateau lying at an elevation of between 6,000 and 7,000 feet.



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MOUNTAINS NEVER SEEN BEFORE BY HUMAN EYE FLASHED INTO VIEW

The peaks rise 12,000 feet near the Hearst Land coast, on the mainland of Antarctica. Ellsworth sighted them as he flew over Stefansson Strait to the continent and named them Eternity Range. He found them a striking contrast to the flat, low peaks of the Antarctic Archipelago, which he had followed from Dundee Island. From appearance he believes them to be of sedimentary origin (page 8).



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"WE CAME ABEAM OF A SOLITARY LITTLE RANGE—I NAMED ITS CENTRAL PEAK MOUNT MARY LOUISE ULMER, FOR MY WIFE"

"Her unfailing help was a bulwark of support," says Lincoln Ellsworth (page 9). This group of mountains, christened Sentinel Range, was sighted about ten miles south of the line of flight when the explorers had been 11 hours in the air.



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ALMOST FREE! SEVERAL DAYS AFTER THE BLIZZARD, WITH MUCH OF THE SNOW SHOVELED AWAY

A difficult task was clearing the flourlike snow from inside the tail of the plane. It had sifted and packed hard from the rear cockpit to the extreme end. It fell to Ellsworth, the slighter of the two men, to crawl in among the struts and bail out the fine grains with a pemmican mug (page 24).



© Ellsworth Antarctic Expedition

GOODBYE TO THE "WYATT EARP"—OFF FOR THE UNKNOWN!

Here the flyers look back at the little mother ship, fast in the ice, as they turn tail and head for the Bay of Whales, 2,300 miles away. From here on the plane skirted the coast of the Antarctic Archipelago for 600 miles and then climbed over the mountains to the Antarctic plateau.

Immediately after getting the altitude of the sun, we went inside the tent and started our primus stove, putting a pot of snow on to melt for water in which to boil oatmeal and chunks of bacon.

No sooner had we got the oatmeal to cooking than my stiffness from sitting so long in the cramped quarters of the plane manifested itself. To get in through the balloon entrance of the tent, it was necessary to crawl on hands and knees. One could not see what was to right or left of him. So I bumped into the primus stove, spilled our oatmeal, and we had to start preparing our meal all over again (p. 12).

We spread out our reindeer sleeping bags and between observations tried to sleep. In addition to the strain of 14 hours' flying, we experienced a feeling of tenseness because we did not know what lay ahead.

In the plane we had been wearing a suit of silk and wool underclothes next to the skin, over which was a camel's hair suit of underclothes, then an ordinary flannel shirt and a pair of ordinary trousers. The crease, by the way, never came out of Kenyon's trousers!

Outside the flannel shirt Kenyon wore a reindeer parka and I had on the Arctic squirrel parka given me by Amundsen. On our feet we wore two pairs of heavy woolen socks, over which were canvas knee boots with rubber soles. These we found excellent for our snowshoes; but the canvas became wet through and our feet were never dry.

WELCOME RELIEF FROM DAZZLING WHITE

I went out once to get exercise between observations, but the monotony of the terrible expanse of endless white got on my nerves, so I was glad to get back into the four walls of the tent. There are 24 hours of daylight in this region at this time of year and that, too, wears on the nerves.

The temperature here was 15 degrees below freezing.

During our 19 hours in this first camp we strung up the antenna wires on the bamboo sledge poles and put the trail set into operation, working it by hand. We kept on sending, although we got no response. Thinking we had the wrong wave length, we kept changing the length of the



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SNOWED IN BY AN ANTARCTIC BLIZZARD

No sooner had the flyers pitched their tent than a blizzard broke upon them. For three days they lay in their sleeping bags while the air temperature was 5 degrees below zero, Fahrenheit. A 45-mile gale threatened to carry away the tent, but the pegs, frozen firmly in the snow, held. During the flight across the plateau the *Polar Star* made four landings. This was at the third camp.



© Ellsworth Antarctic Expedition

AVIATION'S VERSION OF THE HOT WATER BOTTLE

The canvas warming hood, in place under the nose of the plane, was used for 45 minutes before each start to limber up the *Polar Star's* stiff "muscles." A fire pot was placed under the canvas. This photograph, also at the third camp, shows the snow shoveled from in front of the plane.



© Ellsworth Antarctic Expedition

"ELLSWORTH IS HERE," SIGNIFY THIS STREAMER AND TENT

It was planned before the flight that the *Wyatt Earp* should sail for the Bay of Whales as soon as the explorers took off from Dundee Island. When the radio failed and those on the ship did not know the fate of the flyers, they steamed first to Chile to take on a relief plane, then turned toward the Bay of Whales. As a signal of their arrival, the flyers erected this camp and the orange streamer at the mouth of the bay, six miles from Little America, where they lived in Admiral Byrd's deserted huts. Ellsworth left a note in the tent to inform the finder that he and Kenyon were safe.

antenna wires, but still no response. We assumed, being 6,400 feet above sea level, that there were no intervening mountain ranges to deter contact with the outer world. We always sent general calls besides trying to get contact with the *Wyatt Earp*.

We were surprised at the ease with which we could land or take off on the hard surface. It required not more than 50 yards to rise from the snow when we left this first camp on November 24. The next leg of the flight lasted a brief 30 minutes, and we came to ground because of low visibility (79° 30′ S. latitude; 107° 55′ W. longitude). We again set up our tent and waited three days for good weather.

Midnight of the third day saw us flying again, but only for 50 minutes. The weather was so thick we could barely see to land. Evidently we were on the down grade to the Ross Shelf Ice, for the ground elevation here, at latitude 79° 58′ S. and longitude 114° 15′ W., was 6,200 feet.

No sooner had we pitched our tent than a blizzard was upon us (p. 21). For three days we lay in our sleeping bags trying to keep warm. It was minus 5 degrees Fahrenheit and so cold I had to take my fur parka from beneath my bed and draw it over my feet and legs inside the sleeping bag.

I thought surely the tent would go with us inside it, as the floor cloth on which we lay was sewn to the sides of the tent. We were spared this unceremonious ejection only because the pegs holding the guy-ropes had frozen so firmly in position that even the 45-mile gale could not tear them out.

NEW DATA ON ANTARCTIC WINDS

When the blizzard abated we were able to cut snow blocks to erect a shelter to windward of our tent. No doubt it helped, but still the blasts of wind billowed in the tent on Kenyon's side and kept sliding him over almost on top of me as we tried to rest and sleep. Kenyon complained laughingly that the tent seemingly was always pitched so the billowing was on his side.



Photograph courtesy Discovery Committee Colonial Office

NEWS OF THIS MEETING AT LITTLE AMERICA WAS FLASHED AROUND THE WORLD

A landing party from *Discovery II* reaches Byrd's abandoned ice village and finds Ellsworth and Kenyon safe. Ellsworth (center) had been suffering from an infected foot caused by freezing and could not go, as Kenyon did, to the Barrier face to meet the visitors. "Have you anything to eat?" were almost the first words uttered by the hungry newcomers, unaccustomed to arduous exercise on shore, when they found the flyers (page 32).

During the whole mid-section of our flight—that is, from the time we left Eternity Range until we started on the down grade to the Ross Barrier—the prevailing winds blew from the east and southeast. Only twice did we have a north wind, and that lasted only for a few minutes. We never had a west wind.

Eight days—that is, until December 4—the storm held us prisoners in this cheerless camp. We accumulated grease and dirt, for we were never able to heat enough snow on the little cooking primus to wash with. We had to bring the gasoline generator for the radio into the tent to get it started. The exhaust soon blackened the tent and us, too.

Our only excursions outside during the blizzard were to use the wireless on our schedule three times daily and to fill our gallon bucket with snow for water in which to cook our morning meal of porridge and boiled bacon, and the evening meal of pemmican.

Our food ration was 34 ounces a man each day, but we were not obliged to adhere to the allowance, as we ate only twice a day. Even then we were never very hungry.

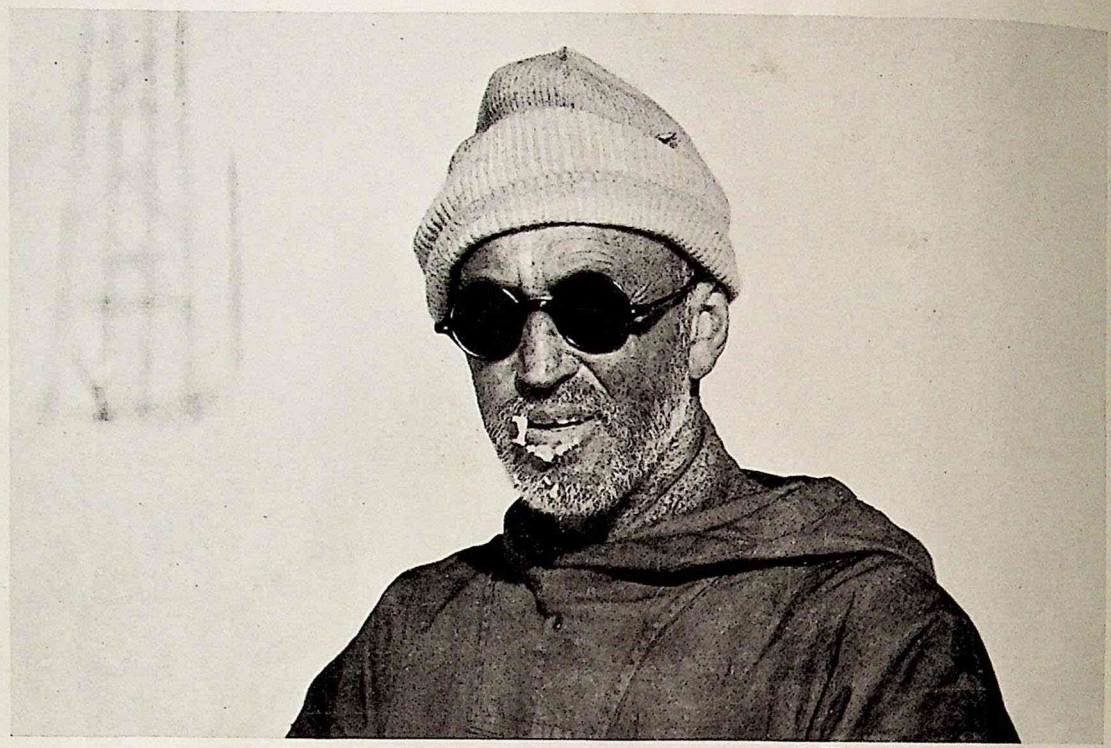
In the morning, we again had a mug of oatmeal with chunks of bacon boiled in it, milk, sugar, and oat biscuit with butter on the side. In the evening we had a mug of pemmican, oat biscuit and butter.

WHEN LIFE OR DEATH DEPENDS UPON AN AIRPLANE

I thrived on this simple diet, just as in 1925 with Amundsen I never grew tired of our menu of hot chocolate morning and night, and pemmican at noon. Intense interest and enthusiasm for the task have a strange influence upon one's mental attitude.

One evening, over a mug of pemmican, Kenyon voiced what was in my mind when he said, "Maybe this is all meant to try us out," and I remembered the beautiful promise in the old hymn:

"So long Thy power hath blest me,
Sure it still will lead me on."



© Ellsworth Antarctic Expedition

TWO OF ANTARCTICA'S RARE "GROWING THINGS"—BEARDS AND ICICLES

Lincoln Ellsworth after two months without a shave. No washing was possible during this time, for the fuel supply was too scant to permit melting snow except for drinking and cooking. Dark glasses were worn to prevent snow blindness from the glare, which seemed worse on cloudy days than on sunny ones.

Catastrophe might be lurking just ahead should our frail man-made contrivance of metal and wood, lying inert and lifeless, deeply buried in the snowdrift beside our little tent, grow weary of its mission and set us adrift there where 630 miles separated us from our destination. True, the coast was only a few hundred to our north, but even so there might be a hundred miles of pack ice between it and open water.

There would be seals, and perhaps penguins. After that, what? Though one learns to accept disappointment in those regions, the thought of a month's man-haul on foot was anything but inviting.

All these things did come to mind one morning when we tried unsuccessfully to start the airplane motor after warming it for an hour. We were being buried deeper and deeper in the snow. The situation seemed bad. If we could just get out of that hole, nothing else seemed to matter.

Of all abominable jobs in Polar regions, next to man-haul, the worst is shoveling snow. It is dry, fine as flour, sifts into everything, and packs as hard as rock.

After the blizzard we discovered that the entire tail of our plane was one solid block of snow. Since I was more slender than Kenyon, it fell to my lot to crawl in among the control cables and struts to bail it out. With a bucket and pemmican mug, this job took one whole heart-breaking day (p. 19).

All the time in this camp we were beset by many troubles. The valve of the primus stove leaked air and constant pumping was necessary to keep the flame going.

Kenyon showed his ingenuity again when, from among the spare parts of the plane, he found a lead valve which we whittled down and, with the aid of a washer, fitted on the stove.

Then, too, the drift kept piling up around the plane and it seemed as if we would be buried.

Although the plane radio set had ceased to function when we were 1,300 miles from our destination, or opposite Charcot Island, our first rendezvous base previously agreed upon, we were not then particularly concerned because we were provided with three means of communication.



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BELIEVING HER OWNER "LOST," THE "WYATT EARP" FLIES SYMBOLS OF GRIEF

Because no word had come from Ellsworth and Kenyon, owing to failure of their radio, the party on the ship feared they had perished and flew flags at half-mast. Here the ship forces its way through the rough ice off King Edward VII Land, northeast of the Bay of Whales. Several days later it reached the bay and found the explorers safe.

In addition to the plane set powered by the motor during flight, we carried for auxiliary power, when not flying, a portable generator of 300 watts; we had also a hand-operated trail set complete in itself. It seemed unreasonable to suppose that all three means could fail. Nevertheless, owing to conditions still unexplained, they did fail in their primary purpose, which was to keep in touch with my ship.

Until the time we were forced to abandon the plane, 16 miles from the Bay of Whales, we were faithful to predetermined schedules for broadcasting. Twice each "night" and once every "morning" we tried to reach the *Wyatt Earp*. After the exhausting task of turning a frozen hand crank for 10-minute intervals, while standing in a biting wind with the temperature minus five, all we ever heard from the ship was the sentence, "We can't hear you."

AFTER 8 DAYS IN "BLIZZARD CAMP"

The defect was not in our receiver, for three times we got time signals from the powerful Buenos Aires station—a fortunate reception which enabled me to keep track of my chronometer error.

We decided that we must get out of that hole, irrespective of the weather ahead, so after eight days in the "blizzard camp" we put the canvas hood over the motor, and placed the fire pot inside for 45 minutes, as we always did before starting. Then we cranked the engine. After a couple of weak turns the propeller would stop with a choke.

Kenyon knew better than I what was wrong, and after connecting the antenna wire from the stronger radio battery to the starter he had the propeller going in no time. With the plane unpacked of everything we pulled out of the drift.

Then we loaded up again and took off immediately into a sky which was anything but promising. This was the most trying moment of the entire flight.

We had not been flying long before the horizon became clear and the sky took on a beautiful golden glow.

After three hours and 55 minutes we came down to make another observation and to check our fuel.



© Ellsworth Antarctic Expedition

THE ANTARCTIC EXPLORER'S ICE BOX

Carcasses of pork and beef are hung in the shrouds, where the cold air keeps them constantly frozen. The meat hangs so high that spray rarely reaches it. In rough seas it is a ticklish job getting these porkers down.

We had used up a great deal of gas climbing over the Eternity Range and in making three take-offs. Also there was the added distance, for we later found that instead of 2,100 miles, the completed flight was really 2,300 miles.

What a picture! The snow sparkled like jewels. There was no wind. Once more it was good to be alive; we had left the high plateau and were only 125 miles from the Bay of Whales. We were on the Ross Ice Shelf at last, 980 feet above sea level, at latitude 79° 15′ south, longitude 153° 16′ west.

We had flown over the previously unexplored area. We were on the territory explored by Byrd, and all we wanted now was to get to our destination.

THE GOAL OF THREE YEARS' ENDEAVOR

Restless and anxious to be off again, we slept very little that daylight night. At 5:58 the next morning we took the air, and at 9:50 we reached the north end of Roosevelt Island. We were actually 16 miles south of the Bay of Whales, but we did not know this at the time.

From the air we saw the ice-free waters of the Ross Sea—the goal of my three years of endeavor.

At 10:30 the *Polar Star* slackened her speed and, like a weary bird, came gently to the snow, her 466 gallons of gasoline completely exhausted.

We dug two-foot trenches for the skis, weighted them down with snow, and then pitched our tent. We knew we were not far from the Bay of Whales, and, standing on the wing of the plane and looking ahead, Kenyon saw what he believed to be Little America. It appeared to be not more than four miles away.

In reality, what we thought was Little America four miles away was an old pressure ridge, and what Kenyon thought to be the windmill generator coated with ice



Photograph courtesy Discovery Committee Colonial Office

LITTLE AMERICA, 1936: A JUMBLE OF MASTS AND POLES ON A FIELD OF SNOW

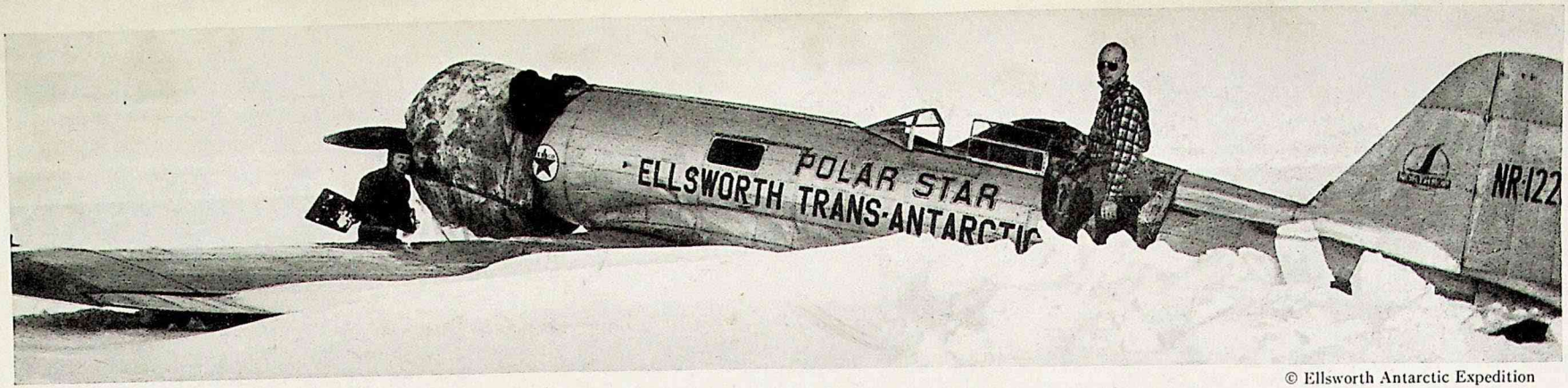
Taken upon the arrival of the party from the *Discovery II*, this picture gives an idea of how the village looked when Ellsworth and Kenyon came upon it after trudging from their abandoned plane. Under the snow is a labyrinth of rooms and passages constructed by Admiral Byrd's expeditions. Projecting stovepipes made it possible to find the underground rooms.



© Ellsworth Antarctic Expedition

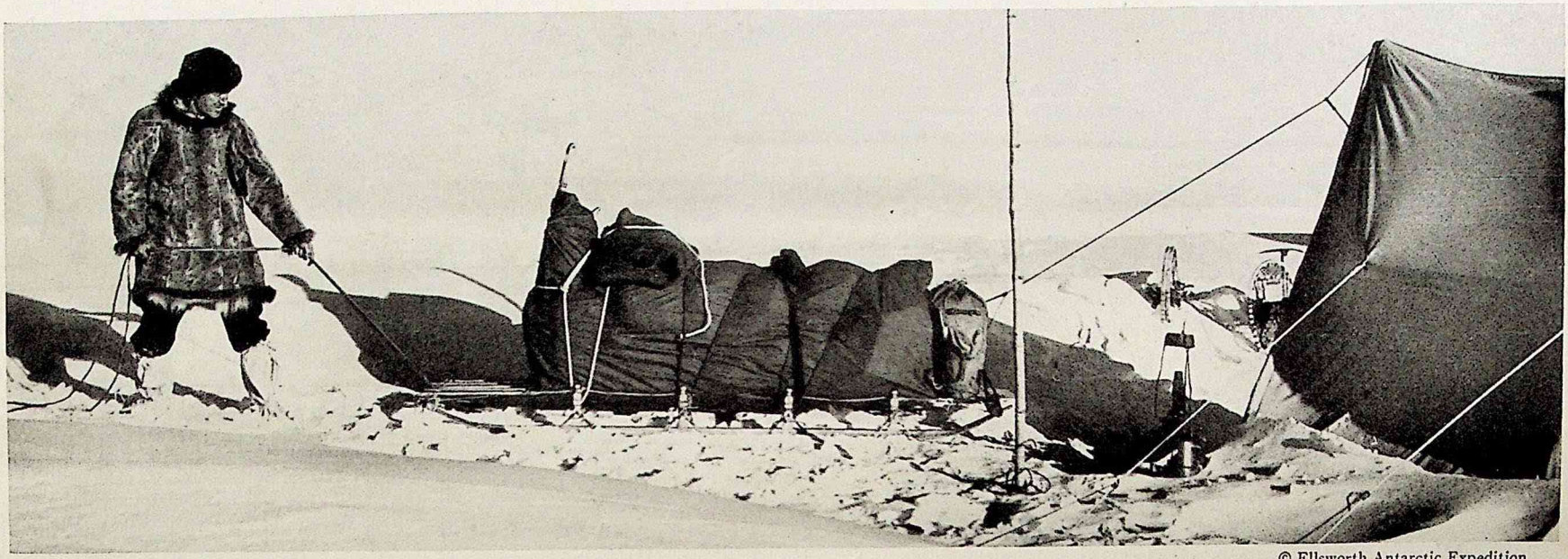
THE "KEY TO THE CITY" AT LITTLE AMERICA WAS A SHOVEL

Here is the shaft, leading to the old radio shack, dug in the snow by Ellsworth and Kenyon. In this building, lined with bunks, they kept house for a month (see page 31).



© Ellsworth Antarctic Expedition

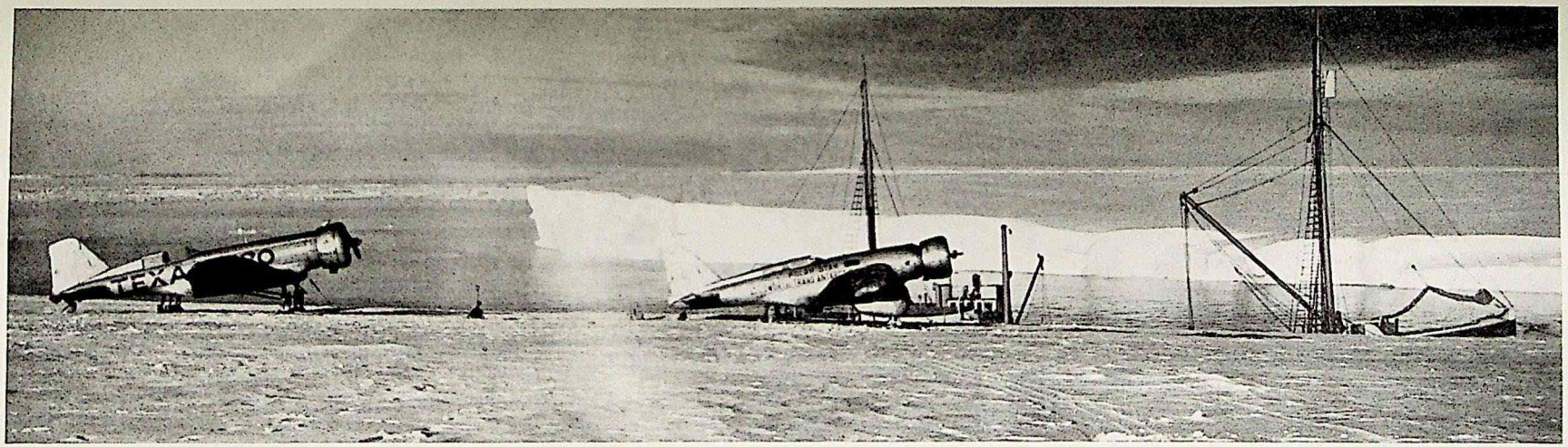
MEN FROM THE "WYATT EARP" HELP TO DIG OUT THE "POLAR STAR" FROM ITS BED OF SNOW (PAGE 34)



© Ellsworth Antarctic Expedition

FUEL EXHAUSTED, MAN-MUSCLE BECOMES MOTIVE POWER ON THE LAST HARD TREK TO LITTLE AMERICA

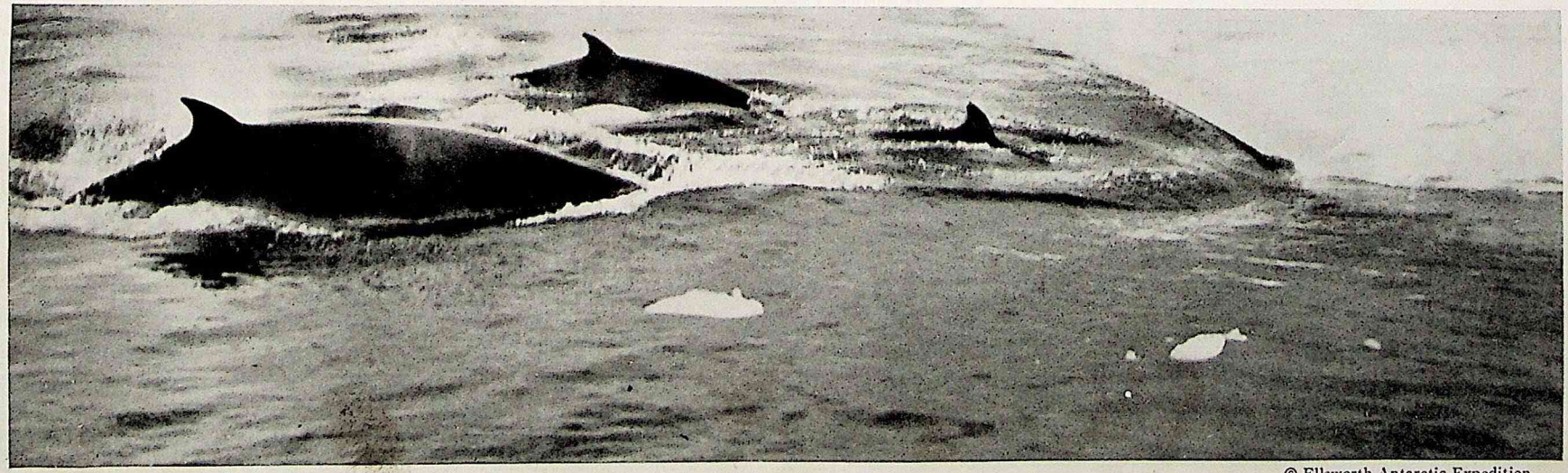
Sixteen miles short of the goal, the last drop of gasoline was used and the *Polar Star* settled on the ice. With sledge packed, Ellsworth (shown here) and Kenyon set out for the rigorous man-haul over the rough, snow-covered ice. They wear snowshoes.



© Ellsworth Antarctic Expedition

DWARFED BY THE IMMENSITY OF THE BARRIER, THE "WYATT EARP" TIES UP TO THE WORLD'S SOUTHERNMOST AIRPORT

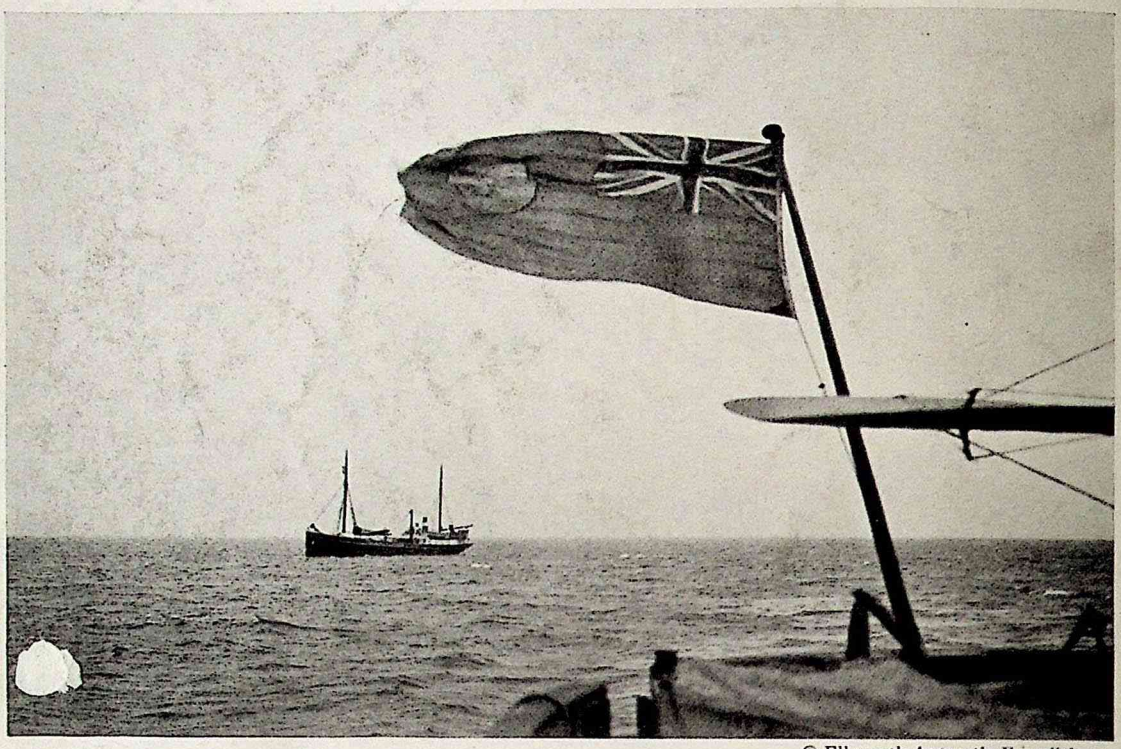
Their work done, the relief plane and the *Polar Star* line up at the edge of the Barrier, ready to be shorn of their wings and hoisted aboard. Ellsworth's famous airplane now is preserved in the U. S. National Museum, at Washington, D. C.



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THE BAY OF WHALES IS RIGHTLY NAMED! A SCHOOL OF FINBACKS SPORTS AND SPOUTS

This cleft in the Ross Ice Barrier is a happy hunting ground for whales because the water is rich in plankton, minute sea life on which the creatures feed.



© Ellsworth Antarctic Expedition

THE BLUE ENSIGN FLUTTERS A WELCOME TO THE EXPEDITION'S FLOATING HOME

The *Wyatt Earp* arrives at the Bay of Whales after her 5,100-mile voyage from Dundee Island, by way of Chile. The picture was taken from the Royal Research Ship *Discovery II*, exploring ship of the Discovery Committee of London, which arrived three days earlier and found Ellsworth and Hollick-Kenyon at Little America (see page 32).

was an old ice cake turned on end and standing above the pressure ridge. We had stowed our tent and sextant with other things beside the plane. So after having traveled 15 miles—which it was, instead of four—we left our sledge and tramped back to the plane to get our tent and sextant. We had taken on the sledge only three weeks' supply of food.

We made this 30-mile journey in one sledging, resting but an hour at the plane, and it was the only time in the whole journey that we really sweated. This was a lesson never to leave our tent behind!

That was December 9. Each of us had on a suit of camel's hair underwear, a flannel shirt, and light trousers, over which was worn a "windbreaker"—that is, a parka and pants of balloon silk. Kenyon wore two pairs of heavy socks and over them rubber-soled, high canvas boots reaching to the knees. I had the same, but unwisely introduced a pair of moose-hide Indian moccasins between the heavy socks and the canvas boots. Moisture caused the moccasins to shrink and stiffen, and the result was that I froze a foot.

Before starting the flight, we had debated the choice of skis or snowshoes. After loading the skis, we took them out and substituted three-foot snowshoes. It was well we did, for drawing a sledge over the slippery surface of the sastrugi would have been impossible for us on skis.

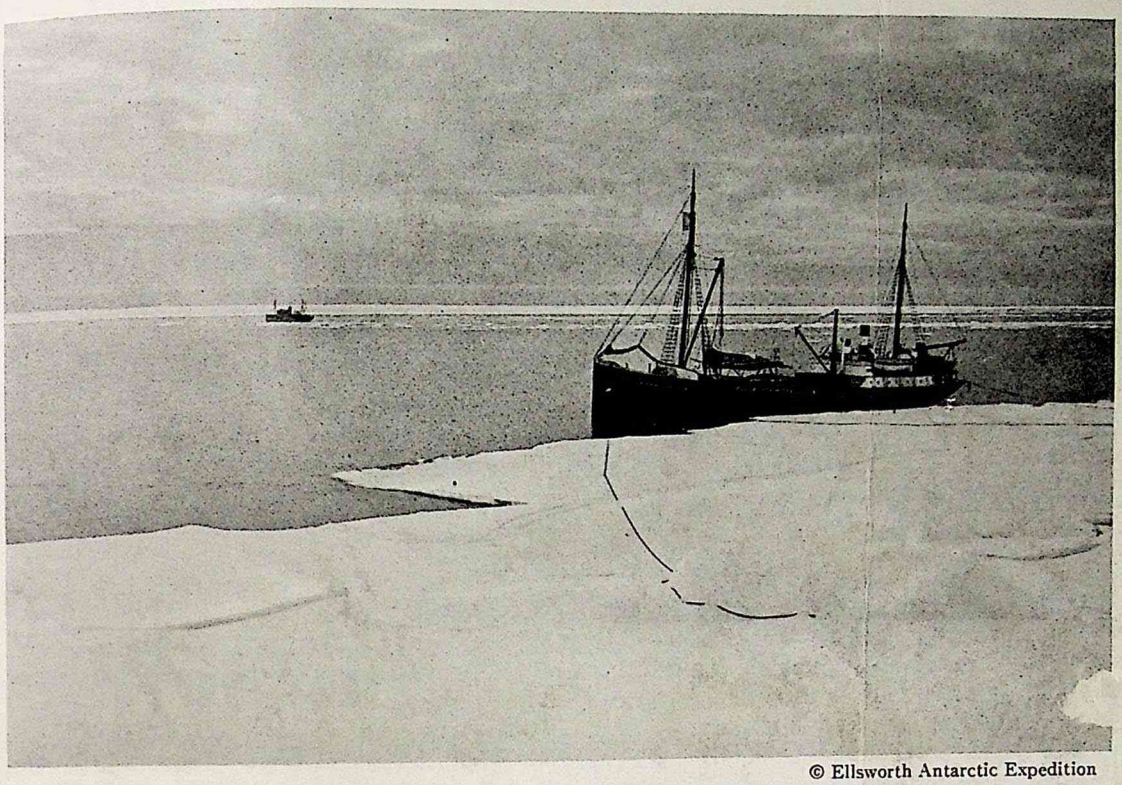
MAROONED BY A FOG

Our search for Little America was complicated by the advent of a fog which lasted for five days and made it impossible for us to see more than 100 feet ahead. Thus we had to travel entirely by compass and estimated distance.

Our system was to pull 15 minutes and then rest four minutes. A day's work consisted of six hours.

In other words, we made 10 miles a day. In addition, my frozen foot held up our progress.

One late afternoon we could discern through the mist ahead the crest of a ridge and thought it odd on that flat shelf-ice surface. We hastened our march to get a better view, and perhaps see the Ross Sea in the distance. We heard what we imag-



© Ellsworth Antarctic Expedition

HOMEWARD BOUND, THE "DISCOVERY II" LEAVES THE BAY OF WHALES

Mr. Ellsworth, on board, first visited Australia, where for 12 days he was the honored guest of the Australian Government; then he crossed the Pacific by liner to Los Angeles. The *Wyatt Earp*, moored to the edge of the bay ice, remains behind while the crew recover the marooned *Polar Star* from the Shelf Ice (pages 28 and 34).

ined to be the wind against the other side of this ridge.

We mounted the ridge and looked straight down into the Ross Sea! We were standing on the edge of the Ice Barrier. Two hundred feet down lay the sea. What we thought to be the wind was the lapping of the waves against the ice.

We retraced our steps and camped that night a mile back, for after attaining our goal, we did not feel like being dumped into the sea. The Bay of Whales, 16 miles long and 5 miles wide, is a pretty small dot on a map of Antarctica, and Little America, which lies at the head of the bay, is even smaller. It was really remarkable that we found either at the end of a 2,300-mile flight.

We remained in camp two days and, on the 15th, followed the edge of the Bay of Whales to Little America, reaching it just 22 days after leaving Dundee Island.

One does not see Little America until he tops the crest of the ridge, which is itself not observable from any distance, for the topographical features all become merged into one white expanse.

Once on the crest, there lies Little America at one's feet in a saucerlike depression. It was breath-taking to come suddenly upon something black in the limitless expanse of white.

I looked down upon a jumble of poles and masts, and was reminded of the oil fields of California. Poles and towers were to be seen, but where were the houses?

None was in sight, but closer inspection showed the tops of a dozen or more stovepipes sticking out of an undisturbed snow surface (page 27). It looked just as if some gigantic plant had taken root there and was forcing stubby shoots upward. We were certainly glad after a 15-mile haul that day, December 15, to find anything indicative of a house.

Digging around, we found a skylight, pried it open, and by means of loops knotted in our sledge rope—a trick used to get out of a crevasse which I had learned in Switzerland—we climbed down to find ourselves in Byrd's radio shack (page 27).

We quickly decided to make it our home. There were two rooms; one had a stove in the middle and a double tier of bunks lin-

ing the wall. Both were partly filled with snow that had sifted in.

How good it seemed after 22 days to find ourselves enclosed by four walls, in a place where we could sleep to our hearts' content, undistressed by the perpetual daylight glare from the snow which had so disturbed our rest since leaving the *Wyatt Earp!*

Next day we went on a foraging expedition: found two sacks of coal and half a drum of fuel for our primus stove, which we used for cooking; also a sack of hardtack and a can of bully beef partly buried in the snow.

LITTLE AMERICA OFFERS SILENT HOSPITALITY

We dug a shaft and made steps in the side of it so that we could get in and out of the door of the shack without having to enter through the skylight. We found other skylights and were able to assemble an enjoyable assortment of odds and ends—such as flour, jams, and sauces.

Then we settled down to await the arrival of the *Wyatt Earp,* whenever that might be.

One morning about two weeks later when I awoke, Kenyon already was at the stove cooking oatmeal. "I hope they won't bother us for at least another week," he said.

We certainly were grateful to Byrd for the sustenance we found at Little America, because our own supplies would not have held out longer than three weeks. With the additional supplies we found there, we could have lived three months. Besides, there were many seals on the bay ice.

We were short of coal and fuel for our primus stove. When we were found we were on the last sack of coal, and only a quarter of a drum of fuel for our primus remained of what we had found in Little America.

I recalled Byrd's willingness to help us out with radio weather reports the year previous when he sent us two daily over a period of two months.

I have repeatedly been asked since returning why we did not use the radio equipment left at Little America. There was no radio equipment of any kind left there.

To live there, our daily routine was as follows: Supper around 9 p. m.; in our sleeping bags until 3 or 4 p. m. the following day; a light meal, possibly oatmeal with raisins and tea; clean up cabin; maybe wash up dishes, depending upon how clean they were left from the previous meal; melt snow for the evening meal.

Then I would walk six miles to the mouth of the Bay of Whales to look out to sea for the *Wyatt Earp;* return home generally to find Kenyon had opened the skylight of another cabin and found another sack of coal, or more Worcestershire sauce, or marmalade, cans of tobacco, or magazines.

January 15 will forever remain memorable in the minds of Kenyon and me. It was 10 p. m. I was awakened from a sound sleep to see Kenyon standing over me with a note in his hand.

"Read it," he said, nonchalantly. "It's probably from Wilkins."

"Wilkins!" I excitedly replied. "Is he here?"

"No," he said, "but it has just dropped."

Kenyon had heard the roar of a motor overhead, although our dugout home was 15 feet beneath the surface of the snow. He had crawled up the shaft leading to the surface above in time to see a parachute descending through the enshrouding fog which had enveloped us for two weeks.

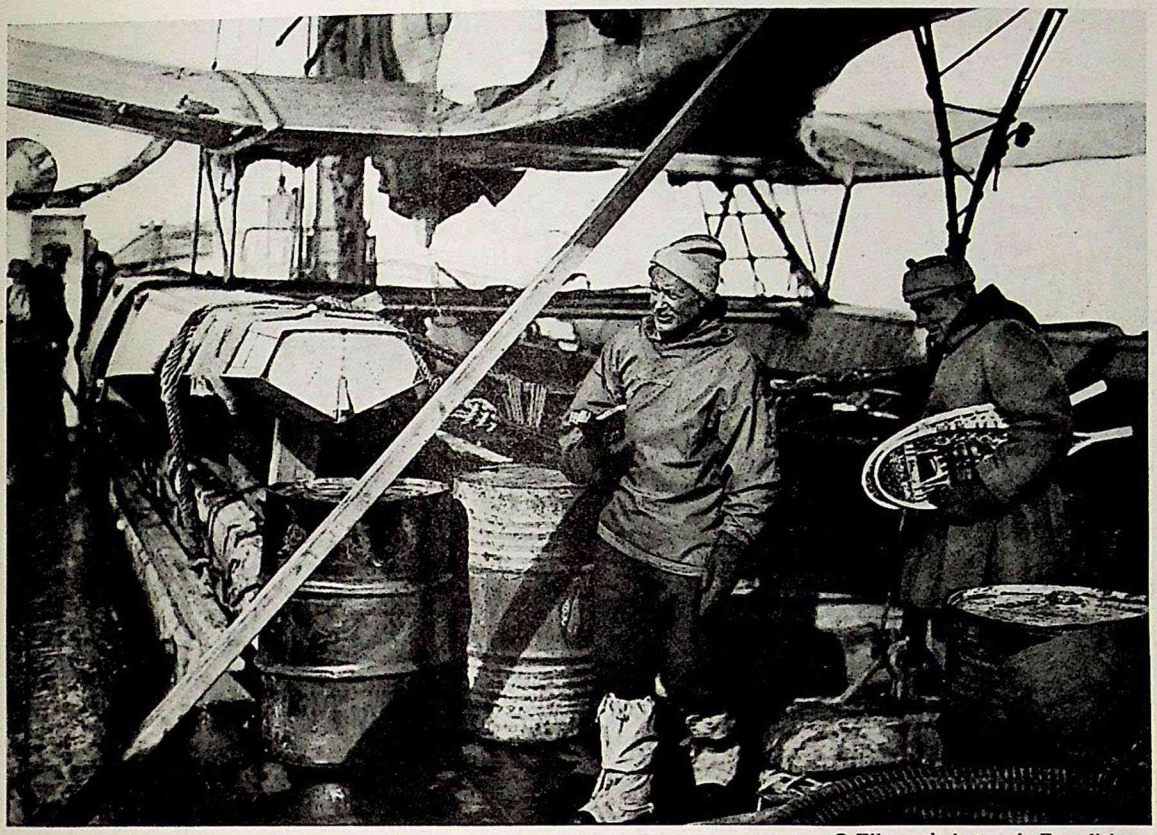
We opened the parcel delivered by parachute and in amazement spread its contents out on the table—packages of chocolate, raisins, and a can of very sweet, highly concentrated orange syrup, which we promptly drank undiluted. It almost made us ill.

AN INVITATION DROPS FROM THE SKIES

This note was from Captain Hill of the Royal Research ship *Discovery II,* and requested us to march until we met some of his men whom he was sending ashore.

Within ten days after the failure of our radio a relief expedition had been set in motion at the suggestion of the Prime Minister of the Commonwealth of Australia, a suggestion which was promptly seconded by the Governments of the United Kingdom and New Zealand. The *Discovery II,* then carrying out whaling investigations in the south, was summoned posthaste to Melbourne to be loaded with supplies for an exhaustive search by both land and air if this should prove necessary.

Carrying two airplanes, flyers of the Royal Australian Air Force, sledges, and extra rations for long marches over the ice, the *Discovery II* left Melbourne for Dunedin and the Bay of Whales just one month from the day we started our flight.



© Ellsworth Antarctic Expedition

THE OWNER COMES ABOARD!

After two months on the Antarctic plateau and at Little America, Lincoln Ellsworth and Hollick-Kenyon board the *Wyatt Earp* at Bay of Whales. Overhead is the plane flown from Kansas City to Magallanes, Chile, and then brought south in case it should be necessary to search for the flyers.

How glad we were to hear their planes and to greet the first humans we had seen in eight weeks can well be imagined!

I shall always feel grateful both to the Research Committee of London and to the Australian Government for their earnest and generous efforts on our behalf.

As I was now laid up with an infected foot, because of freezing it, and was not feeling so well, Kenyon started off alone to meet our visitors. I could sleep no more that "night," so cooked myself a big meal and, after waiting until noon, started out on snowshoes to learn what was up. A mile from camp I saw through the fog, which magnifies frightfully in those regions, what appeared to be a whole army marching toward me; in reality there were six men (page 23).

About the first thing they asked me after our greetings was, "Have you any food?"

Naturally they were very hungry from their unaccustomed exercise, so we turned back to Little America. After they had cleaned up all the food in the shack, the sledge was packed and we started for the ship, *Discovery II,* where I was received with open arms.

The doctor found that my foot had gone septic and that I was running a temperature of 102. After I had a hot bath, my first in three months, Commander Hill told me of events leading up to his arrival and gave me the news that my ship had been delayed by the pack ice in the Ross Sea.

Three days later we received a wireless from the *Wyatt Earp* saying she was approaching the bay.

And soon there she was, staunch little ship, looming big in the fog that enshrouded her after her 5,100-mile voyage from Dundee Island to pick us up. And how happy I was to see again the comrades I had learned to love so well during three years' voyaging!



© Ellsworth Antarctic Expedition

FLAGS THAT WERE FLOWN ACROSS THE LAST CONTINENT TO BE EXPLORED

The Stars and Stripes and the four banners of organizations with which Ellsworth has been closely associated were set up for this photograph on Dundee Island shortly before the start of the trans-Antarctic flight. The leader wears a squirrel-skin parka given him by Roald Amundsen.

While my party on the *Wyatt Earp* was loading the *Polar Star,* I went on the *Discovery II* to Australia, where I was for 12 days the guest of the Government. Never have I experienced more delightful hospitality than from those kind people.

NOT "LOST" OR "RESCUED"

Many Antarctic problems remain to be solved; yet our reconnaissance flight has shown the airplane to be a practical means for their solution. When two men alone can cross the continent, land at will on terrain well suited to the purpose, and take off again—which we did four times during the journey—the way is opened to complete exploration of that vast continent.

We saw no crevasses except in the area flown over just before reaching Roosevelt Island. Doubtless airplanes of the future will carry dogs and other necessary equipment for the establishment of bases from which to operate ground and aerial surveys. By these means the whole continent may be charted.

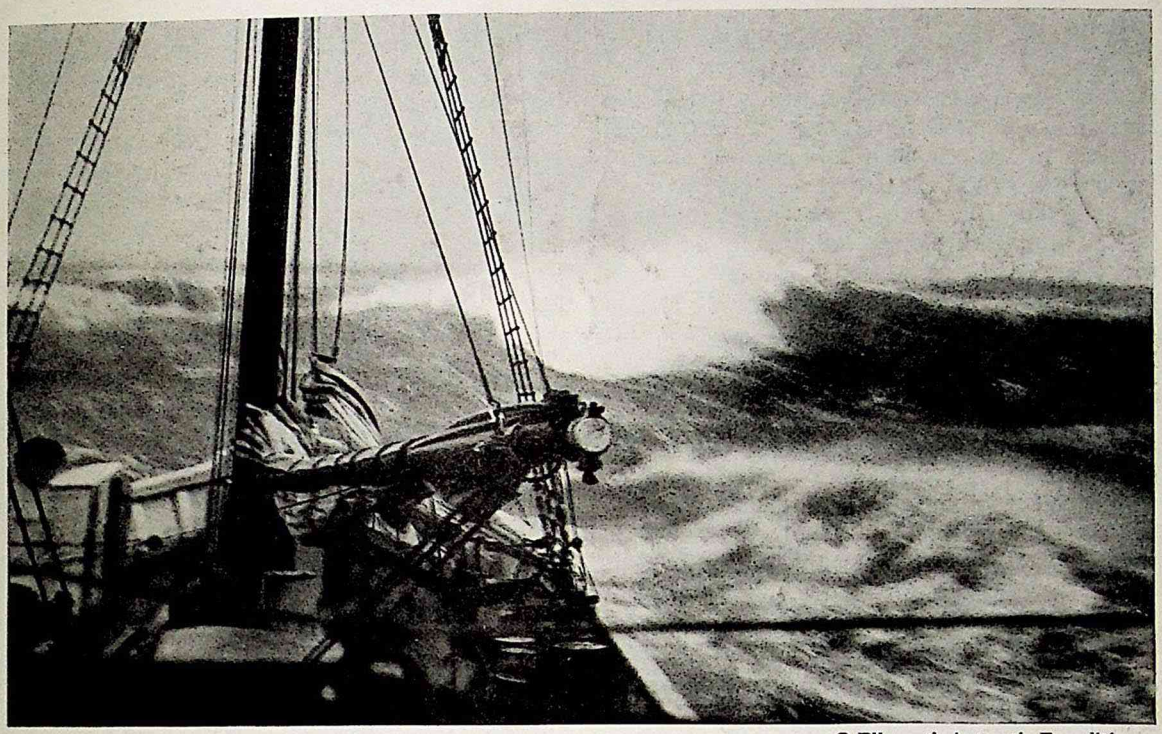
Of course, luck favored us; another year conditions might be as unfavorable as they were during the two preceding years.

We approximated a great circle course, and, after flying 1,550 miles from Dundee Island to where we first came down, we were only 45 miles off our plotted course. We checked our compass with celestial observations at each landing.

Everything went exactly as we had planned and hoped, with two exceptions—our radio communications broke down and our gas, owing to three unexpected drains on it, gave out just 16 miles short of our goal. Of course, there was the possibility of crossing on a single flight; but I had no illusions about this. One of the most important features of my plans for the past three years had been to land on the snow in case of bad weather and wait for the return of good flying conditions.

Because our radio signals failed to reach the outside world, we were said, popularly, to be "lost." But, of course, this was not true. At no time was there the slightest doubt in our minds as to our location.

Again, because nothing had been heard from us, we were said to be "rescued." But our very comfortable stay at Little Amer-



© Ellsworth Antarctic Expedition

HEAVY GOING IN THE TURBULENT WATERS THAT GUARD ANTARCTICA

Where the Pacific, the Atlantic, and the Indian Oceans meet the Antarctic Continent are found the roughest seas in the world. The *Wyatt Earp* here plows her way through enormous waves south of New Zealand. Three trips to the Antarctic were made by the Ellsworth Expedition. The first year it touched at the Bay of Whales. Next, bad weather prevented a flight from Deception and Snow Hill Islands. The third, and successful, venture was made from Dundee Island.

ica and the shifting to that point of the *Wyatt Earp* to pick us up also had been planned for three years.

THE RESULTS OF THE FLIGHT

The lofty mountain ranges and the high plateaus discovered on our flight probably are but units of a great mountain system that traverses Antarctica. The highlands of the Antarctic Archipelago must be regarded as the continuation of the South American Andes; and may they not link up with the mountains of South Victoria Land, on the Ross Sea, of which the Queen Maud Range is but a connecting link in this great chain that forms the backbone of Antarctica? If this be true, then a sea-level channel between the Weddell Sea and the Ross Sea cannot exist.

Our one regret was not to have been able to follow the trend of the ranges we saw and learn something of the rocks that compose them, for probably the greatest unsolved problem regarding the earth's structure is the connection of the two sides of Antarctica—between the Weddell and the Ross Seas.

Although our flight of discovery is over, there are still vast untrod areas at this end of the earth, regions of heights and depths and cold, still touched with the mystery and romance of the unknown. Great is their lure!

Moreover, they are all parts of our heritage and it is man's duty to explore them. Seventy-five per cent of Antarctica's five million square miles remains unexplored and open to scientific research.

After six polar expeditions my enthusiasm has not dimmed.

The love of great adventure is not an acquired taste—it is in the blood. Will I be tempted again? Who can tell?

"Who has known heights and depths shall not again know peace, for he who has trodden stars seeks peace no more."

ELLSWORTH AWARDED THE HUBBARD MEDAL

At the White House in Washington, D. C., at noon of April 15, President Roosevelt, on behalf of the National Geographic Society, presented Lincoln Ellsworth with The Society's Hubbard Gold Medal. The President said:

"Lincoln Ellsworth, it is always pleasant to have a part in the recognition of achievement and this occasion is one of greater pleasure to me because it is a reminder that the world still holds high adventure for those who have the spirit to seek it. There was real romance in that Antarctic flight of yours which carried you over a trackless area upon which human eyes never before had gazed, and I am particularly happy to welcome back home an old friend.

"And now that venture in discovery, as well as your flights over the Arctic—all of which enlarged the sum of human knowledge—are to be rewarded by the National Geographic Society. It gives me special pleasure in behalf of that organization, which was founded for 'the increase and diffusion of geographic knowledge', to hand to you the Hubbard Medal for 'Heroic and Extraordinary Achievements in Arctic and Antarctic Exploration from 1925 to 1936.' "

Mr. Ellsworth replied:

"Mr. President, I thank you for presenting to me the Hubbard Gold Medal of the National Geographic Society and for the kind things you have said. May I add that the most important incident of my trip across Antarctica was the raising of the Stars and Stripes in that territory of 350,000 square miles, the last unclaimed land on earth."

In Constitution Hall on the afternoon and evening of April 15 Mr. Ellsworth addressed two distinguished gatherings of members and guests of the National Geographic Society, describing his historic flight across the Antarctic Continent and showing lantern slides of photographs made on his three Antarctic expeditions.

Introducing Mr. Ellsworth, Dr. Gilbert Grosvenor, President of The Society, briefly summarized his many explorations:

"With great happiness we have gathered to welcome safely home a member of our Society, Lincoln Ellsworth, who has added another fruitful journey to a long record of outstanding feats of exploration.

"Son of a distinguished and generous captain of industry, who offered to help him travel in luxury, Lincoln Ellsworth preferred to lead a life of extreme physical hardship to toughen his body and enlarge his experience for adventurous research in far-away places.

"After leaving Yale University, he worked as an axman on the first survey party of the Grand Trunk Pacific to explore a new route for a railway across Canada. Promoted to transit-man and engineer, for five years he conducted surveys in the roughest country of western Canada.

"For a year he prospected for gold in Alberta and Alaska. He took part in the last great round-up of wild buffalo for the nucleus of the immense herd the Canadian Government now owns.

"For three years he was field assistant of the U. S. Biological Survey, studying and collecting in the Rocky Mountain Range from Yukon into Mexico.

"He served in the Ambulance Service in France, and after the United States entered the war, became an aviator.

"He made a geological cross section of the Andes from the Pacific Ocean to the headwaters of the Amazon. He discovered a bed of fossil algae at the end of an 800-mile canoe trip in Labrador, and later was the first to discover the same rare fossils in Death Valley, California, one of the most prospected regions in the world.

"Lincoln Ellsworth was co-leader with Amundsen and navigator of the first expedition to explore the polar regions by aircraft. He made possible this important survey of 120,000 square miles of previously unknown area by financing the expedition. He rescued the engineer and mechanic from drowning when they fell through the ice after the two planes alighted a few miles from the North Pole. For this gallant deed, which Amundsen declared saved the lives of the six men in the party, the Norwegian Congress voted him its highest award, the gold medal for lifesaving.

"Again he was co-leader, and the generous financial backer, of the Amundsen-Ellsworth-Nobile Transpolar Flight in the airship *Norge* from Spitsbergen across the North Pole to Alaska. This exploration uncovered the largest remaining blind spot in the Northern Hemisphere and proved that no continental mass of land lies between the North Pole and Alaska.

"Thus Lincoln Ellsworth was co-leader and patron of the first expedition to cross the Arctic Ocean, and now returns as the successful leader of the first expedition to cross the Antarctic Continent."

BOSTON THROUGH MIDWEST EYES

By Frederick Simpich

STUDY Boston from the high tower of the Customhouse. It looks down on that cobweb maze of narrow, crooked streets which marks the "city limits" of bygone days, when cows grazed on the Common and clipper ships traded with China and Bombay.

In the shadow of modern structures squat many old-style shops and "countinghouses," already weather-beaten when John Hancock was Governor. To Boston these are more than obsolete architecture; they are symbols of her busy, audacious youth when she built and sailed our first merchant fleet.

Modern Boston sprawls over more than 1,000 square miles and counts some 2,300,000 people in her metropolitan district. Much of that is in the pattern of other American cities. But the old Boston, so like parts of ancient London, is unique in the United States.

Come down from the Tower now and see how certain of these streets are devoted to a particular enterprise. This one smells of hides and leather; along that one you see only the gilded signs of shoe manufacturers. One section smells of fish, another of wool, and here is a wharf fragrant with bananas.

Turn up the hill toward the venerable Transcript, with its columns of genealogy, and you smell newsprint, fresh ink, roasting coffee, and second-hand books stacked in the open air—any book from Gray's "Elegy" to "Anthony Adverse."

Even the odd wording of signboards harks back to earlier days. "Victualers License," "Spa," "Protection Department," not fire department, and street-car signs in quaint, stilted English.

Old trades cling to old places. The Old Oyster House, live lobsters wriggling in its window tanks, stands just as it was a hundred years ago.

Before a window at 30 Court Street crowds watch a wrinkled artist carve pipes. At 87, wearing no glasses, he works as skillfully as when he began, seventy years ago. Monk, Viking, and Indian heads, skulls, lions, dogs—he makes them all.

Give him your picture and he will cut its likeness on a meerschaum bowl (p. 77). For a Kentucky horseman he carved the image of that rider's favorite mount; he even carved the "Battle of Bunker Hill" with 50 brier figures on one big pipe!

Five workmen in pipe stores hereabouts have a total service of more than 200 years. "A man is on trial until he has been here 25 years" is a favorite joke in one shop.

Quietly another old sculptor works, making "ancient" idols, relics of the Stone Age, even a "petrified man" for a circus in Australia!

BOSTON'S POWER FELT AFAR

In sharp contrast rise that colossus, the United Shoe Machinery Corporation, and the United Fruit, whose white fleet plies from here to the Spanish Main.

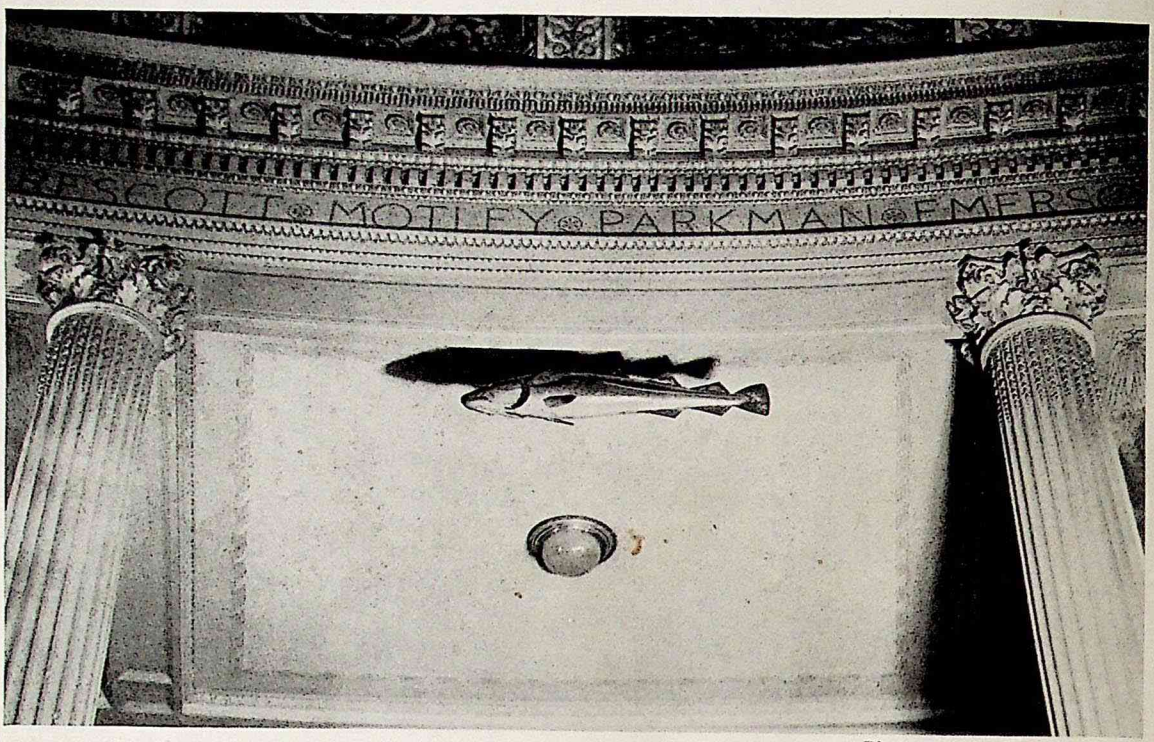
Turn back and walk through the cathedral-like First National Bank and look at its compelling murals, with their dramatic themes of merchant adventures by land and sea; or study the fascinating exhibit of historic ships' models in the State Street Trust Company (page 59).

Then talk with men whose families for generations have helped shape Boston's destiny, and you begin to sense what significant events, affecting all America, are packed in her 300 years of history.

Boston cash and engineering skill built the Michigan Central, the Atchison, the Burlington route, and other railways. Chicago stockyards, to a large degree, were built by men from Boston. She founded the great copper-mining industry in our West; she was the early home of many corporations, famous now in the annals of finance, foreign trade, construction, and manufacturing.

It was Boston brains and money that started the great telegraph and telephone systems that now girdle the globe. Miraculously, almost, she turned the jungles of Central America and the Caribbean isles into vast banana plantations, and built up the greatest fruit industry the world knows.

From Boston, from all New England, went groups of thrifty, energetic men to share in the conquest of the West. To Kansas, especially, many colonists were sent by the Massachusetts Emigrant Aid Company to circumvent the rise of another slave State under the Kansas-Nebraska Act. On the march they sang



Photograph by Luis Marden

SYMBOLIC OF FISHING'S EARLY VALUE TO THE COMMONWEALTH, THE "SACRED COD" HAS BEEN HUNG IN THE STATEHOUSE FOR GENERATIONS

On Wednesday, March 17, 1784, Mr. John Rowe "moved the House that leave might be given to hang up the representation of a Cod Fish." This effigy, made of pine and often repainted, now hangs opposite the Speaker's chair (page 48).

Whittier's song of "The Kansas Emigrants":

"We cross the prairie as of old
The pilgrims crossed the sea,
To make the West, as they the East,
The homestead of the free."

Lawrence, Kansas, is named for an old Boston family, and many a budding Midwest factory town drew its first artisans from that national training school for skilled mechanics which is New England.

Descendants of these pioneers form part of the army of 2,000,000 visitors, more or less, who flock back to Boston each season and swarm out to the historic towns about it. They want to see the old places where their ancestors lived, and spots famous in the annals of early days: Bunker Hill Monument; Faneuil Hall; the site of the Boston Tea Party; Old North Church; Paul Revere's house (page 43); the tomb of Mother Goose; the site of the Boston Massacre (page 75): the sacred Codfish in the Statehouse; and near-by Plymouth Rock, Concord, and Lexington, and the Witch House at Salem.

Today Boston prints more books than when she was preëminently a "literary center." Manuscripts pour in to her editors. Novels, carloads of dictionaries, and schoolbooks in Spanish and English, Sanskrit and Eskimo, are shipped from here, often to markets as remote as Baghdad.

Her Golden Age of letters, when Emerson, Hawthorne, Longfellow, Whittier, Holmes, and Lowell used to frequent the Old Corner Book Store, passed with the rise of New York as a market for manuscripts. But curious visitors still seek out Emerson's old home at Concord; they prowl through the country house of Louisa M. Alcott—admission 25 cents—and drop a tear for "Little Women." For another 25 cents they see the "House of Seven Gables" at Salem.

In American letters Dana's "Two Years Before the Mast," Melville's "Moby Dick" or "Typee," and the brilliant historical work of Prescott, Parkman, Fiske, and Bancroft must long endure, as will other names, from Edward Everett Hale, author of "The Man Without a Country," and



Photograph by B. Anthony Stewart

BROWSING AMONG BOOKS IS AN OUTDOOR SPORT AT THIS "SERVE YOURSELF" SHOP

Customers select volumes from the well-stocked shelves on the sidewalk and pay for them downstairs in the basement store. This establishment is noted for its many books on heraldry and genealogy. The tracing of American family histories is a flourishing enterprise in Boston (page 80).

Julia Ward Howe, who wrote "The Battle Hymn of the Republic," to Thoreau and John Boyle O'Reilly.

From Boston still comes the Atlantic Monthly, though the long-beloved Youth's Companion is merged now with The American Boy, and the New England Magazine is no more. But it is the stupendous output of textbooks which astonishes.

You can imagine the volume when you stop to think that between 25 and 30 million American children alone are enrolled in schools; that they must have some 70,000,000 books when schools open each September, and that Boston is one of the chief textbook-producing centers in the world.

SCHOOLBOOKS BY THE MILLION

"There are many schoolbooks," said an official of Houghton Mifflin Company, "whose sales make that of a popular novel look diminutive. They are not handled in dozens of boxes, but in carloads of 40,000 pounds each.

"While some of our novels, 'Uncle Tom's Cabin' and 'Rebecca of Sunnybrook Farm,' for example, have sold more than half a million each, our little school pamphlets such as 'Evangeline' and 'The Courtship of Miles Standish' have sold at the rate of a million a year.

"The task of getting sufficient schoolbooks ready to meet the sudden demand every September, when orders come in at the last minute by wire, means that publishers usually begin printing these books as long as ten months ahead."

"Where do books made in Boston go?" I asked the editor of Ginn and Company.

"Everywhere, I should say, that English is used in schools. More than that; in translation, they go to scores of foreign lands. Recently orders came from Baghdad for thousands of our Craig's 'Pathways in Science.' Arabic translations of Breasted's 'Ancient Times' and a number of our other books are used in the schools of Iraq. Not long ago we granted the Government of Iraq permission to translate Caldwell and Curtis' 'Introduction to Science' into Arabic.

"You know that the British Isles are a citadel of the classics. We feel gratified,



Photograph by T. F. Hartley

SKIMMING ROUND MARBLEHEAD NECK IN A RACE FROM A HARBOR START, LITTLE INDIAN-CLASS BOATS RESEMBLE TOY MODELS IN A POND

Larger craft, which started to the left of the rocky islet, are also competing offshore. Hundreds of yachts crowd Marblehead during Race Week in August.



Photograph by T. F. Hartley

NEARLY THREE MILES BELOW, BOSTON AND NEIGHBORING TOWNS RESEMBLE SCATTERED PIECES OF A GIANT'S JIGSAW PUZZLE

Boston Common is the large bare patch, lower right. Just above is the downtown district. In Charlestown, left, Bunker Hill Monument is seen in its square park. A tip of Cambridge lies in the center foreground. Across the harbor are: East Boston, center; Winthrop, upper center; Revere Beach, upper left (pages 57 and 61).



Photograph by Fairchild Aerial Surveys

BOSTON FISH PIER IS CROWDED EVERY MORNING WHEN THE TRAWLER FLEET DOCKS TO UNLOAD ITS CATCH

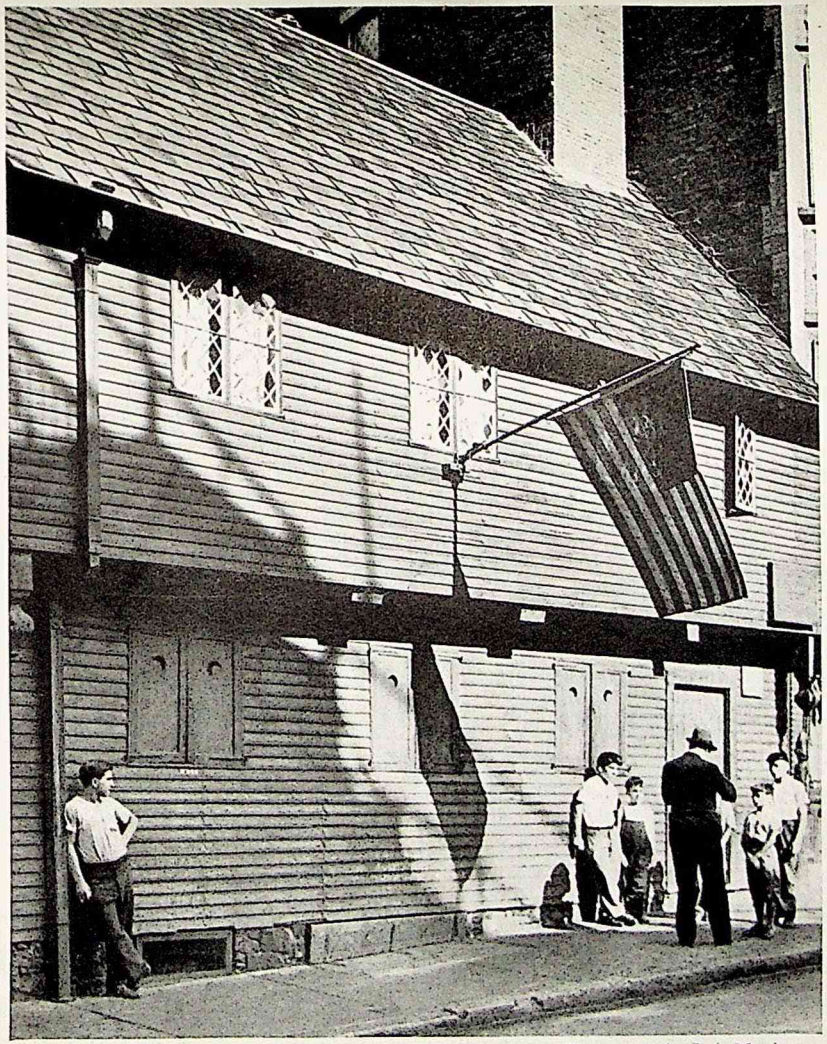
Fish auctions are held in the large hall on the pier's end. Buyers' cars are parked about. All over the busy dock swarm men in rubber boots, pushing their colored fish carts. Inside the court trucks load up, distributing fresh fish far and near (Color Plate XIII, and page 48).



Photograph by Arthur C. Haskell

IN THE FIVE CENTS SAVINGS BANK PEOPLE FROM EVERY CIVILIZED LAND HAVE ACCOUNTS

Signature cards form an autograph album of more than 890,000 names. The statue is of Benjamin Franklin. In the foreground is King's Chapel Burying Ground, where Governor Winthrop and other early Bostonians are interred.



Photograph by Luis Marden

"LISTEN, MY CHILDREN, AND YOU SHALL HEAR OF THE MIDNIGHT RIDE OF PAUL REVERE"

At Revere's house Italian boys entertain visitors with Longfellow's poem. Here the versatile Revolutionary War patriot worked at his trade of silversmith, engraved copper plates, and pioneered in the manufacture of false teeth.

therefore, that our series, 'Latin for Today' is now in wide use in Scotland and England. These volumes are the authorized books in New Zealand and at least one of the States of Australia, besides being much used in South Africa.

"Latin America is today using carloads of textbooks made within a mile of where we sit. They are Spanish readers, geographies, arithmetics, hygiene books, algebras, geometries, and others.

"In Ottawa, I saw a wall map with tiny flags that marked the sites of Indian schools; many were up within the Arctic Circle. All these schools use our books. This summer we had to hurry one new book through for publication early in August so we might get it to these schools before ice closed navigation to the Far North."

Because the editor was an old friend of Philippine days we talked long at Ginn's. It was nearly sundown when I left, the best time for that "walk abroad" through Little Italy (Color Plate XV).

In swarming Salem and Hanover Streets, all sights, smells, and sounds are as purely Italian as Naples itself. Mandolin strains of "Santa Lucia" and "Funiculi-Funicula" come from crowded spaghetti restaurants. Here are little theaters with Italian "talkies," and Italian signs adorn all the shops, banks, newspapers, and steamer ticket offices.

Heavy odors of garlic, sour wine, and black tobacco hang in the air, and show windows are set with goat's cheese, sausages, and rows of dark bottles with bright-colored labels.

At a pushcart, chattering men eat raw clams sprinkled with lemon juice, a penny each, while getting their shoes shined. With a loud honk of horns, a wedding party circles about the quarter, stuffed white doves tied on the motor hoods, and white ribbons waving from the cars.

From upper windows fat wives look down, smiling, waving; and on lines stretched across alleys and courts flaps the family washing. Furtively, one eye out for "cops," boys match pennies and shoot craps.

What a swarm of street urchins besieged us at Paul Revere's house! At Old North Church it was the same. For a penny they mimic the lecture of the sight-seeing bus guides, tell you all about the church, even recite "Paul Revere's Ride." But if you interrupt one of these six-year-old elocutionists in the midst of his recital, he must go back to the first line, starting afresh!

In the older sections of town you meet more Irish than Anglo-Saxons, with more than 5,000 Sullivans and Murphys alone in the telephone directory. Here are about 100,000 Jews, and almost as many Italians.

Along "Emerson's Walk" through the shady Common you hear older people speaking in foreign tongues, but their children use English. Greek and Italian boys on scooters chase the pigeons now, or duck each other in that Frog Pond where once the ducking stool dipped the scolds.

THE VITALITY OF BOSTON

Such racial changes are plainly reflected in political and religious life. But they rob the city of no commercial vigor. Stalwart Brahmans, though many have quit Beacon Hill and Commonwealth Avenue for Brookline, Winchester, and other suburbs, still guide Boston with their inherited mercantile sense and long intercourse with what is good. Their trade and financial genius help her, though overshadowed in mere size by New York and Philadelphia, to maintain her high place as a prosperous Atlantic seaport.

Geographically, here is the trade and population center of rich, industrial New England. A few minutes' ride from Faneuil Hall are more than 5,700 factories and over 25,000 stores of one kind or another.

Boston does not flaunt these distinctions; yet seek and you find she has America's largest drydock; the world's greatest fish-freezing and storage plant. Here is a center of America's paper, wool, textbook, and cotton-manufacturing industries, and the second port in America in volume of ocean-borne passenger traffic.

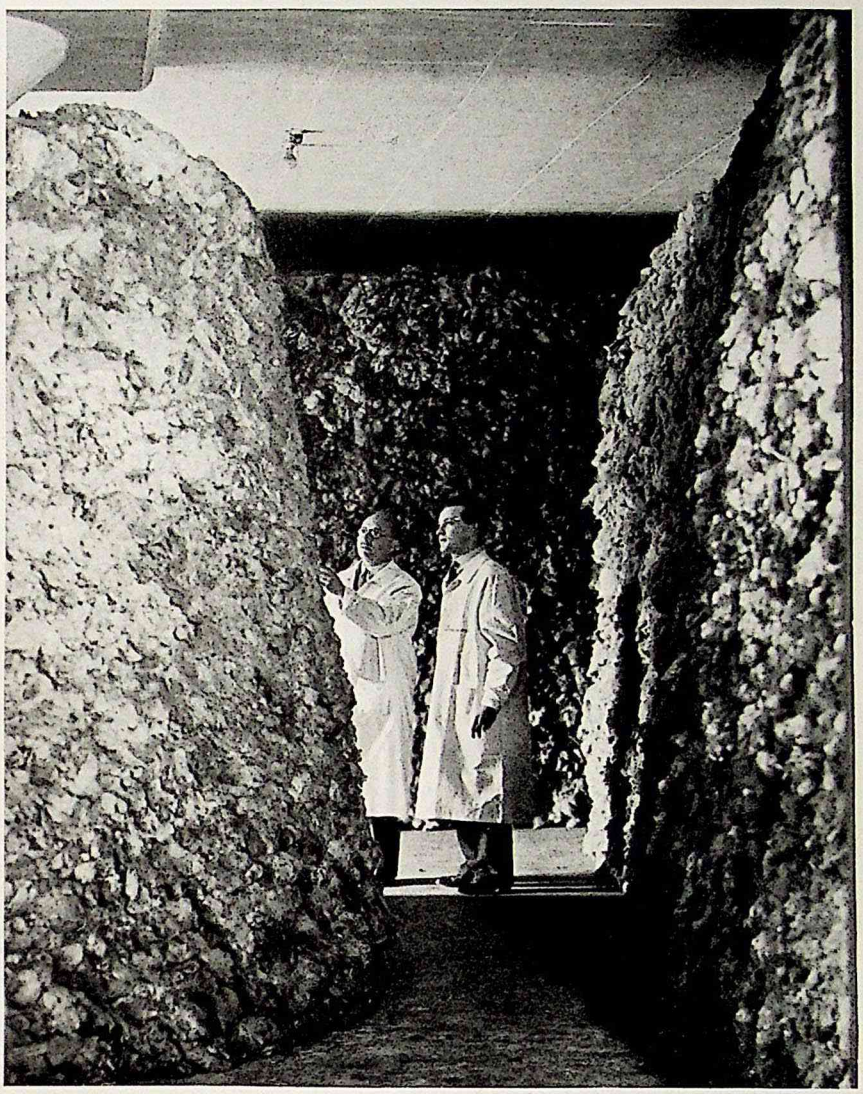
Her deep-channeled harbor, whose modern piers connect with rails and highways, is one of the most accessible on the Atlantic seaboard; it has 40 miles of berthing space and deep water to accommodate the largest vessels.

When "Boston ships" traded hardware for California hides before the days of '49, the shoe and leather industry of New England began. Today, a large share of all hides used in American leather and shoe factories is bought and sold inside one square mile in old Boston, where even in the mid-

dle of the street you catch the acrid whiff of newly tanned leather.

In Bombay Englishmen once pointed out to me "the old American icehouse." It dated from the period, beginning in 1805, when Boston skippers took ice cargoes for sale in Jamaica, Cuba, Brazil, and India. Now high-grade electrical machines, which include refrigerators, rank among Boston exports.

Boston's pioneer place in the import and processing of tropical things is still hers. She and her neighbors make now more than a third of all America's rubber shoes; the trade name of one cocoa made here has been a household word for generations. Jute, burlap, goatskins, fleeces, bales of cotton, sisal, fruit, sugar, coffee, all pass this way.



Photograph by Luis Marden

"THIS PILE IS FROM OHIO; THE ONE BEHIND, OREGON"

More wool is marketed in Boston than anywhere else in the Western Hemisphere. Some families here have been in this trade for many generations. Through storerooms like this experts can walk and tell by a glance where certain wool came from—the United States, Argentina, or Canada. So much wool is handled in Summer Street that even the open air often smells of it (p. 78).

Ask how long skilled workers have served in the same plants; hear how many generations of a given family have worked at the same trades, and you begin to account for the vitality of Boston industry. Here is pride in good work, inherited knowledge, genius for craftsmanship.

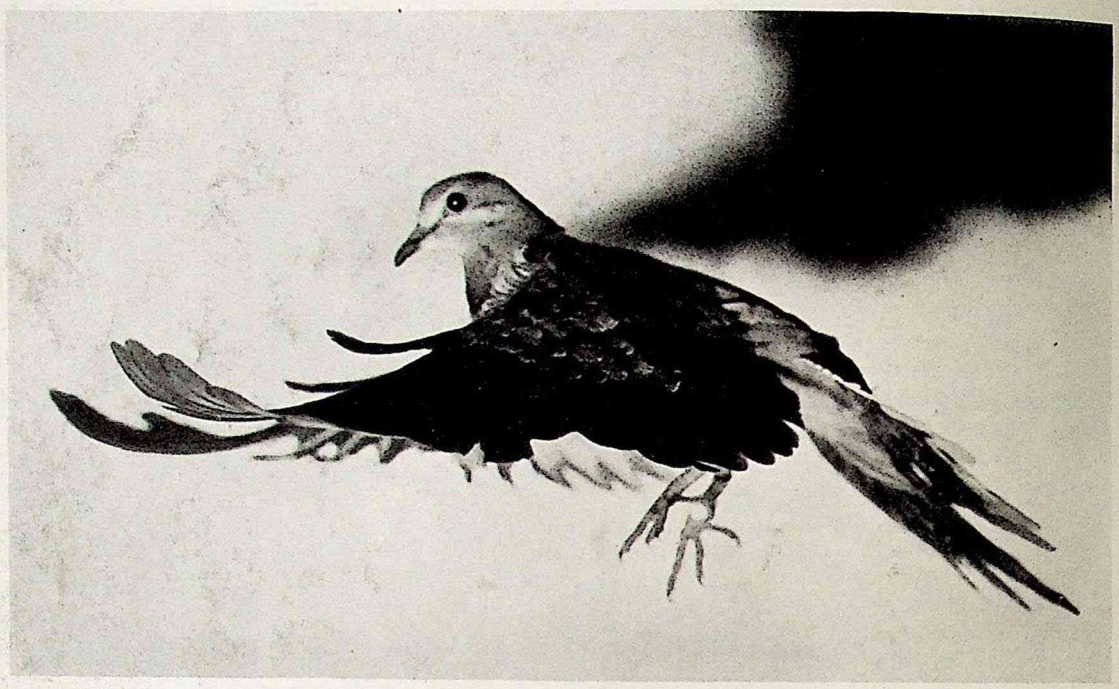
BOSTON COVERS AMERICA WITH BANANAS

John Hancock probably never saw a banana. At the Philadelphia Centennial Exhibition, in 1876, curious crowds gazed in wonder at a bunch of them. Now everybody, from Quoddy Light to Golden Gate, from Key West to Alaska, knows their smell and taste (Color Plate XII).

Boston's United Fruit Company makes the banana, once a rarity wrapped in tinfoil, today a staple American food.

Yet its greatest feat is not in distribution but production.

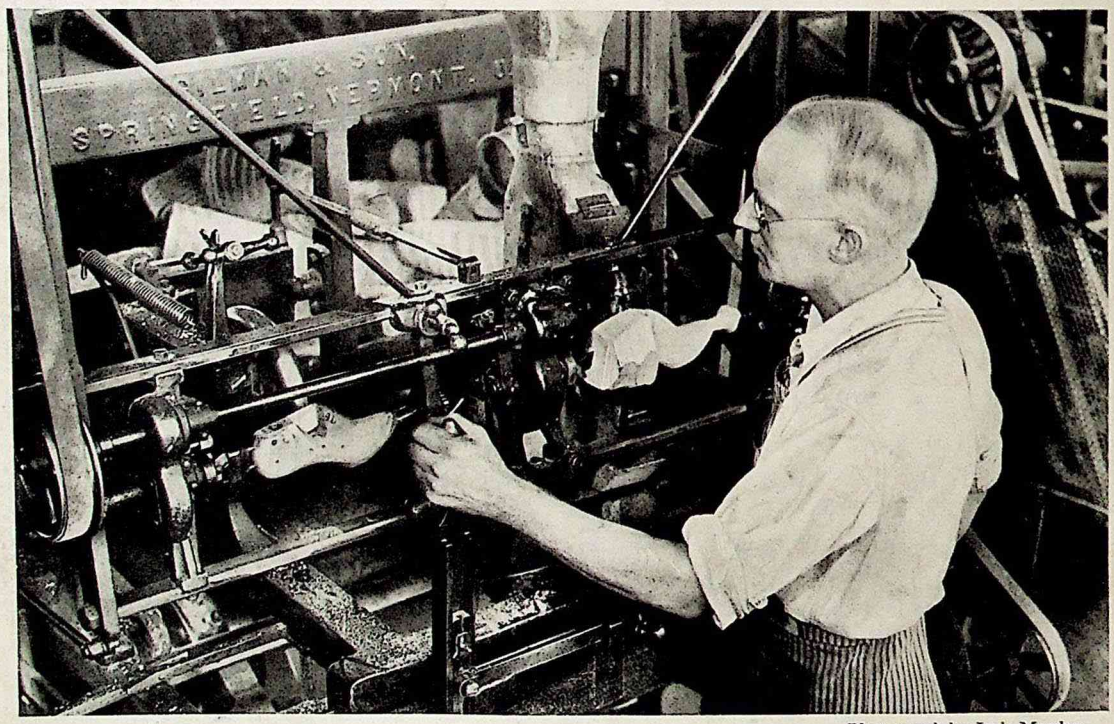
About its success in turning jungle into rich plantations and its conquest of tropical disease, piles of fat books are written. All that is far from Boston, yet it was a Boston man, Andrew W. Preston, who



Photograph courtesy M. I. T.

ON THE DOWN STROKE, WING FEATHERS TAKE THIS POSITION TO HELP THE BIRD GAIN ALTITUDE

This remarkable high-speed photograph was taken by scientists of the Massachusetts Institute of Technology just after the mourning dove started to fly. Its feathers overlap to prevent air passing through its wings on the down stroke; on the up stroke, they rotate slightly, to let air through and reduce resistance.



Photograph by Luis Marden

EXACT COPIES OF ANY MODEL ARE SWIFTLY CUT BY THIS WOOD-TURNING MACHINE

Operating in the colossal factory of the United Shoe Machinery Corporation at Beverly, near Boston, the machine is now copying a shoemaker's last. At left is the model, at right the crude block. It can also reproduce doll heads, decoy ducks, golf club heads—any simple form in wood (77).



Photograph by B. Anthony Stewart

VISITORS EXPLORE THE WORLD INSIDE THIS BIG HOLLOW GLOBE AT THE NEW CHRISTIAN SCIENCE PUBLISHING HOUSE

Glowing with color, a map of the earth's surface is depicted on concave glass sections held by a bronze framework 30 feet in diameter. Standing on the "mapparium's" crystal bridge, one sees our planet from pole to pole, with none of the distortions of area and distance that occur on a flat map.

conceived these incomparable tasks. When he began, long ago, the world banana crop barely equaled what New York alone now eats in a few weeks!

To get bananas the company had to raise them; so it became a vast agricultural concern. Jungle areas cleared and planted total thousands of square miles.

When Minor C. Keith, of United Fruit, started his railroad in Costa Rica from Puerto Limón to San José, a 19-year job that cost more than 4,000 lives from fever, there was but little rail in all Central America. Now the company owns and operates its tracks, trucks, and aerial tramways in a dozen tropic regions. It has built towns, piers, radio stations, hotels, harbors, hospitals; stores, schools, churches, theaters, playgrounds; shops, warehouses, markets; water, light, and power plants, and workers' homes by the thousands.

Besides growing bananas, it raises meat, vegetables, and other foods for its armies of workers, and operates sugar plantations, mills, and refineries; grows coconuts, cocoa, and other tropical products; and annually carries some 40,000 passengers on its 97 ships from Boston, New York, Baltimore, New Orleans, and San Francisco to 25 different ports between Habana and Cartagena, Colombia.

You think of all this when you sit in its Boston offices and watch engineers, munching bananas, draw plans for new drainage works in Panama, or experts testing soils for still more plantations in Colombia.

FISHING IS BOSTON'S OLDEST BUSINESS

Though Boston, remote from grainfields and ranches, must go far for bread and meat, she also covers much of America with fish, as well as bananas.

"But what profit might arise?" That was King James' query when Pilgrims asked him, in 1618, to permit them to sail for the New World.

"Fishing," they replied.

"So, God save my soul!" he exclaimed. " 'Tis an honest trade. 'Twas the Apostles' own calling."

There's a reason why the Sacred Codfish is an emblem of Massachusetts; why its effigy hangs now in the Statehouse, and has hung, in one assembly hall or another, for more than 200 years. It saved the early settlers from starving; preserved with salt from England, it became their first export, their first source of revenue (p. 38).

Boston, like Gloucester, catches many other kinds now, from lobster to mackerel, and helps feed the whole United States. And cod is no longer the favorite; haddock is more in demand. "Come for a trip in my trawler," a skipper said.

Heading for the Stellwagen Bank, the dingdong echo of our radio depth-finder warned us that we were over the fishing grounds, and the big conical net was let go.

Wooden wheels, set on its lower lip, let it roll easily over the ocean floor; big wooden gates at each end, opening outward, kept it stretched wide open, so that it scooped up everything that swam or crawled, from "sea eggs" to squid.

"Last time we got a halibut as big as a horse," said a fisherman. "He weighed nearly 900 pounds."

"And once we found a gold-mounted fountain pen in a big cod's stomach," said another. "The skipper of the *Illinois* uses it now to keep his log."

Coins, spoons, buttons, even pieces of jewelry have been found in fish taken off the New England coast; apparently they seize such bright objects as may fall from passing ships.

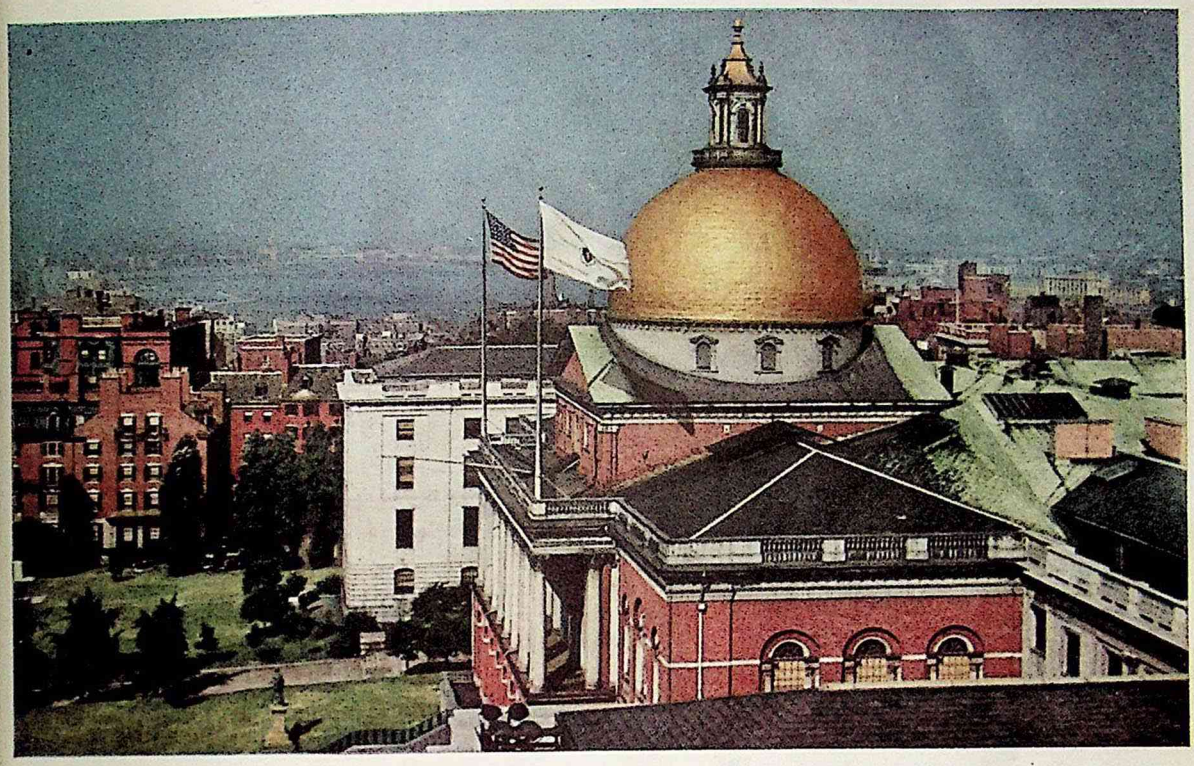
With such suggestive names as *Kingfisher, Penguin,* and *Cormorant,* these trawlers and scores of other boats come back to unload at the huge Boston Fish Pier, which handles fish by the trainload (Color Plate XIII, and page 42).

"Green," or unfrozen, fish is shipped as far west as Mississippi; frozen fish, really fresh fish preserved by freezing which will keep in perfect condition a year or more, reaches the Pacific coast, while salted and dried codfish, or "bacalao," is consumed as far away as southern Europe, the Caribbean, and the coast of Brazil.

Dawn brings the auction in a big "pit" at the pier's end. Signs on the walls say all bidding must be in English; bids *are* called in English, but debates rage with confusion of tongues.

Then this big, busy fish pier echoes with excitement. Men in rubber boots, wearing caps with long visors like duck bills, throw fish into rope baskets that swing them to the docks. Others run hither and yon, pushing bright-colored carts filled with fish, followed by sniffing, hard-faced wharf cats.

These Boston people love the sea. For generations they sailed it to make a living. Now many sail for fun, yet with



WITH ITS GILDED, MOSQUELIKE DOME, THE STATEHOUSE DOMINATES BOSTON

In a literal sense the Capitol is the "hub" of the city. Residents of Beacon Hill, which it crowns, are within walking distance of department stores, theaters, symphony hall, railway stations, even the gangplanks of ocean-going steamships.

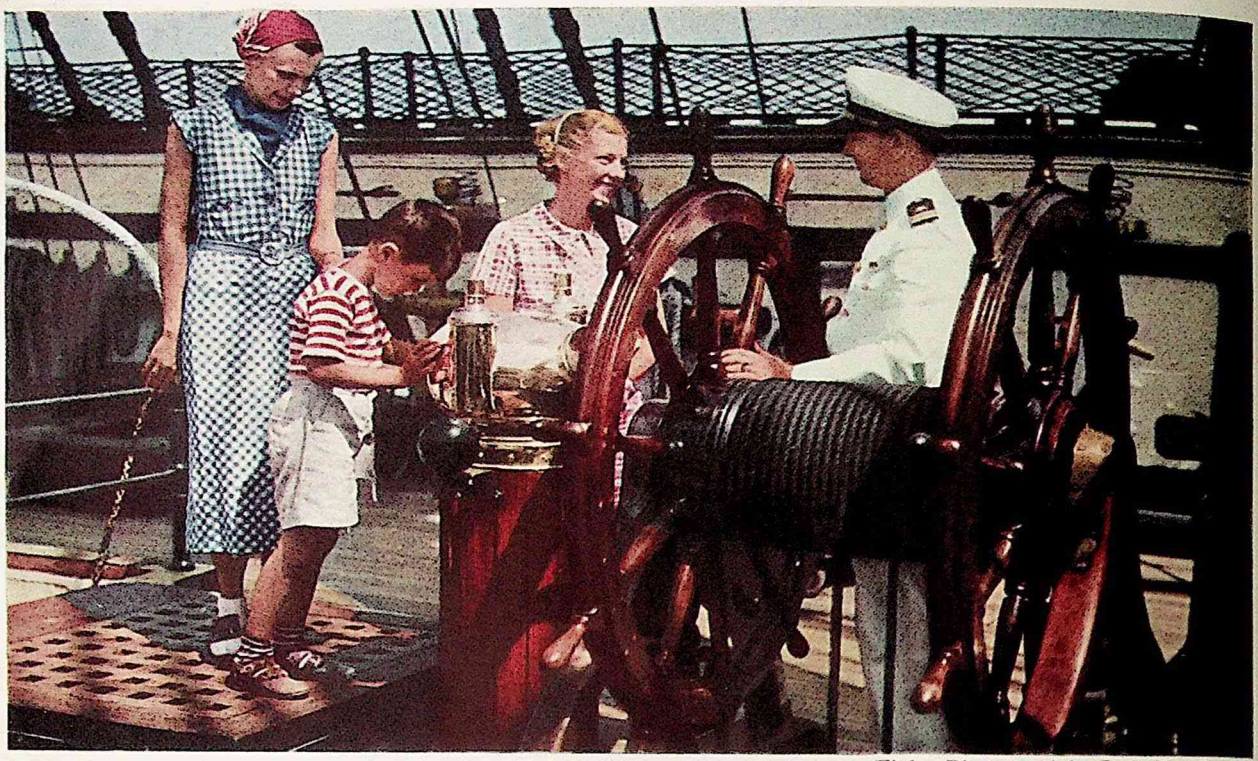


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Finlay Photographs by Luis Marden

ON LAZY SWAN BOATS DREAMERS DRIFT ON TINY PUBLIC GARDEN PONDS

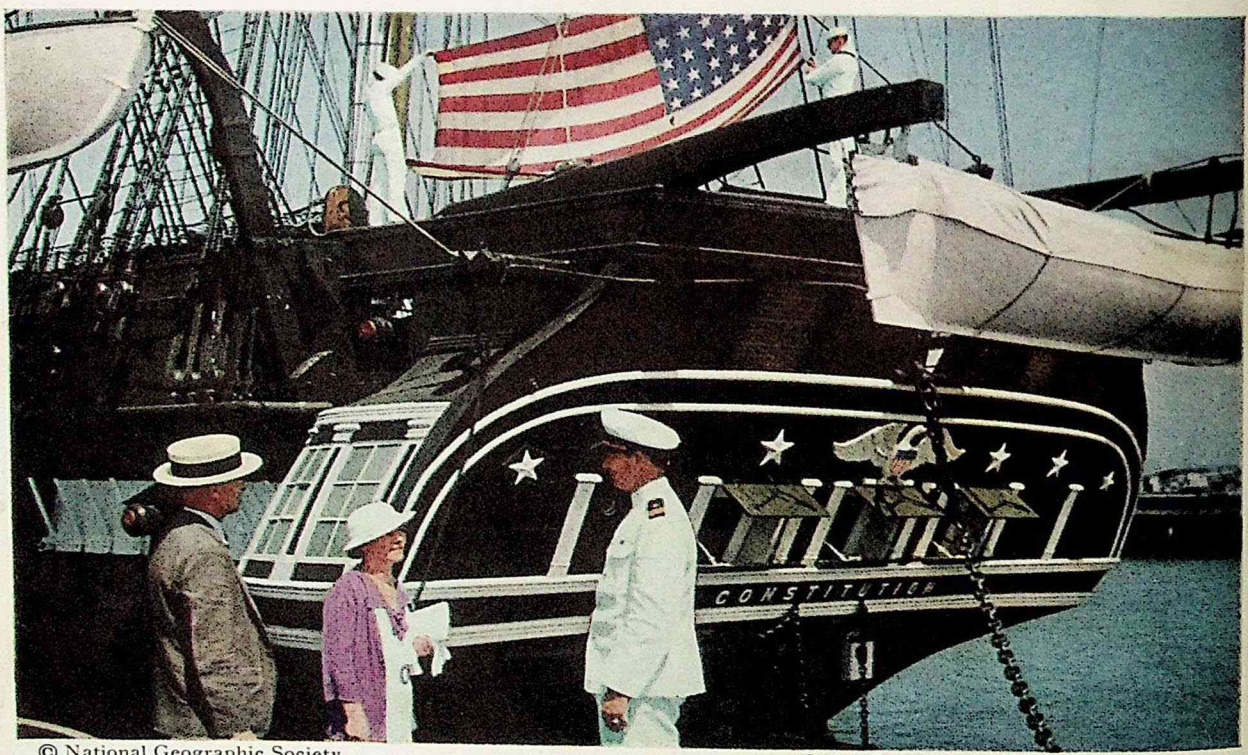
Washington's Tidal Basin and lakes in other cities have their swan boats; but they are driven by motors. Here man power and bicycle pedals, hidden in the swan, propel the silent craft.



Finlay Photograph by Luis Marden

THE "CONSTITUTION'S" WHEEL REPLACES ONE SHOT AWAY BY THE "JAVA" IN 1812

Known familiarly as "*Old Ironsides*," this 44-gun frigate was one of six ordered by Congress in 1794 because of the Algerian piracies. She took part in three bombardments off Tripoli.

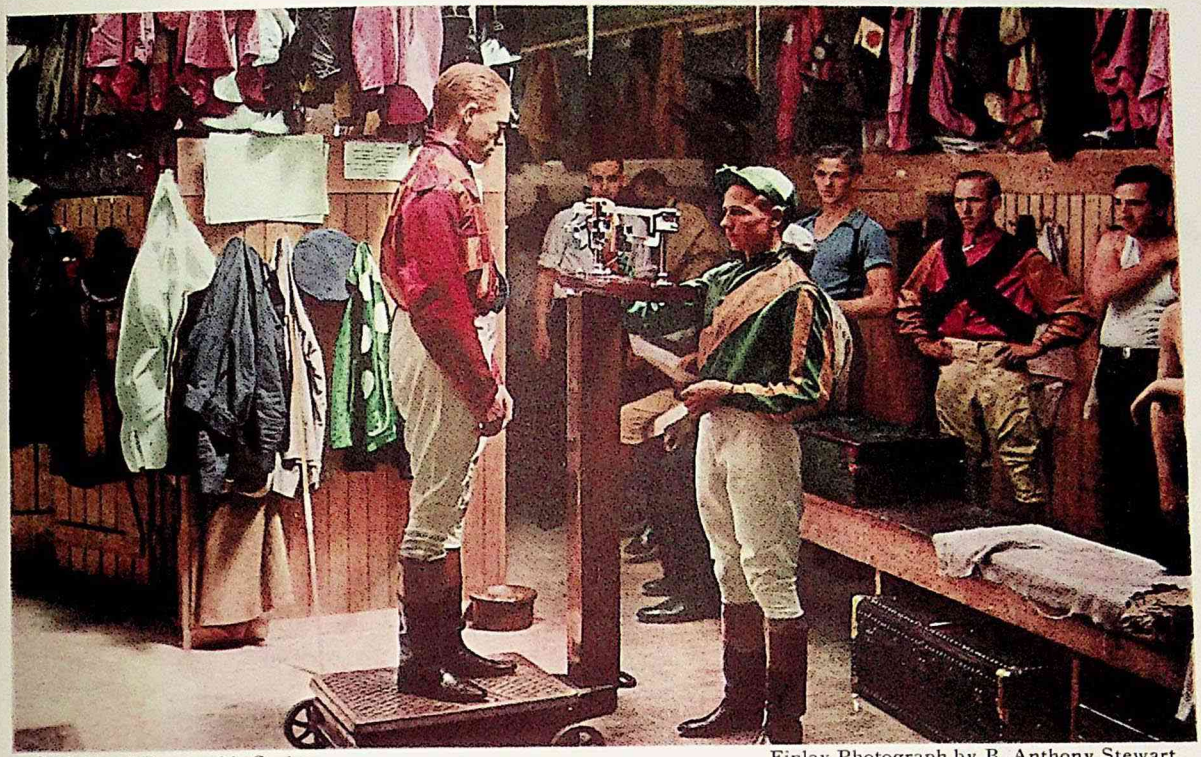


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"OLD IRONSIDES," OFTEN REBUILT, RESTS NOW AT CHARLESTOWN NAVY YARD AFTER A RECENT TOUR OF ATLANTIC AND PACIFIC PORTS

This old ship's fights with the *Guerrière*, the *Java*, the *Cyane*, and the *Levant* are famous in early annals of the American Navy. Condemned as unseaworthy in 1830, she was saved by public demand after Holmes published his poem, "Old Ironsides."



© National Geographic Society Finlay Photograph by B. Anthony Stewart

JOCKEYS WATCH THEIR WEIGHT IN THEIR DRESSING ROOM AT SUFFOLK DOWNS

Recent legislation in Massachusetts permits pari mutuel betting at horse and dog races. Huge crowds flock to this new course at South Boston.



© National Geographic Society Finlay Photograph by Luis Marden

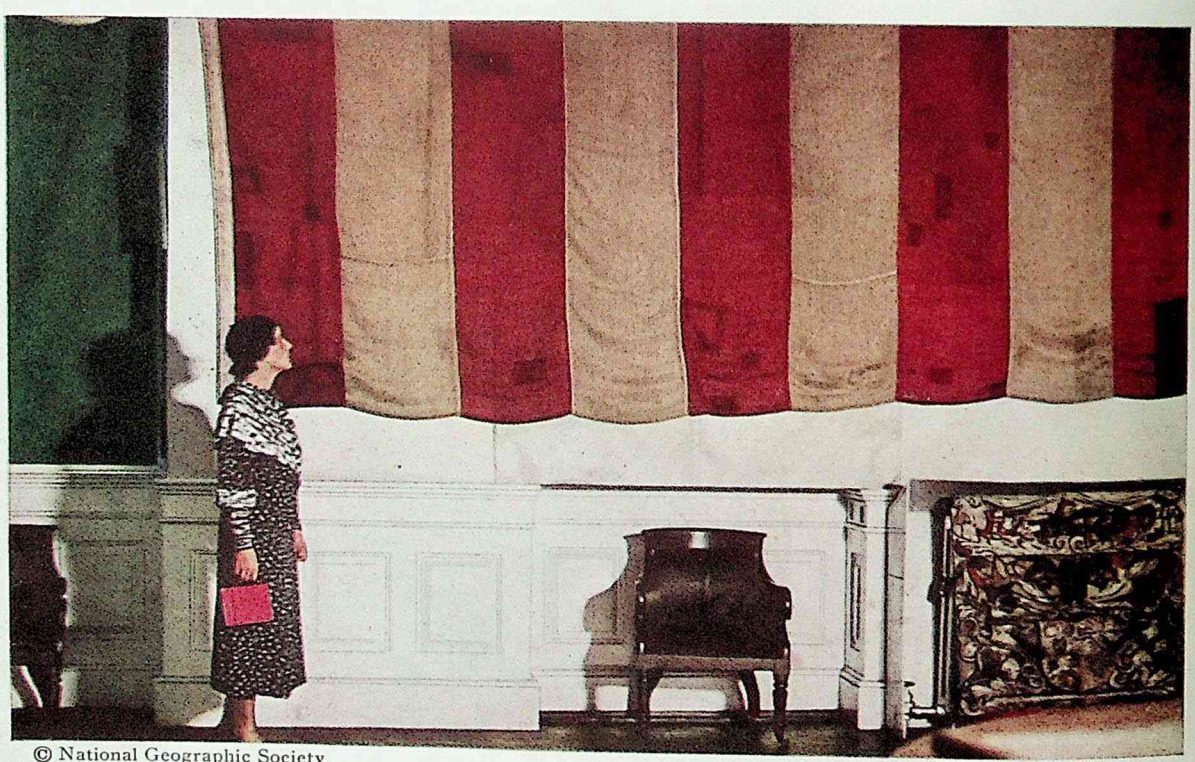
SAMOSET, ALGONQUIN WOODEN INDIAN CHIEF, OFFERS CUSTOMERS A GOOD CIGAR ON MILK STREET, BOSTON

Carl Larsen, who once made ships' figureheads, carved this friendly Indian from live oak which had been seasoned in mud and water storage. Boiled linseed oil is periodically poured down a hole on top the Indian's head to keep the wood from cracking.



PARK GARDENERS FASHIONED THIS CITY SEAL ON THE LAWN OF COPLEY SQUARE

Formed from colored shrubs set in a green grass background, the inscription reads: "As to our fathers so may God be to us. Given by the Government of the City, A. D. 1822." In the center, "Boston, founded A. D. 1630."



© National Geographic Society

Finlay Photographs by Luis Marden

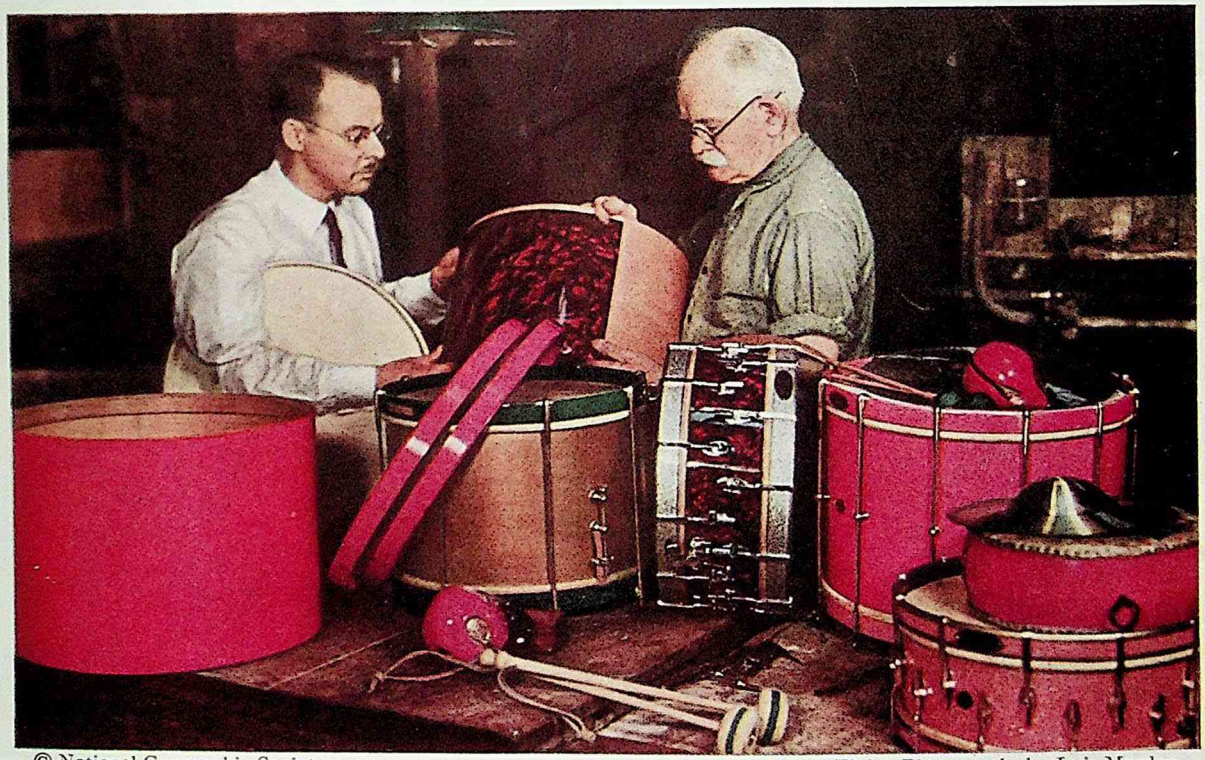
HISTORIC LIBERTY TREE FLAG IS CAREFULLY GUARDED BY THE BOSTON SOCIETY

The donor's letter says: "Presented by John C. Fernald. In August, 1767, a flagpole was erected, extending upward through the (Liberty) tree . . . . From the pole, a flag was flown to call the Sons of Liberty together . . . . This is that flag."



A MILLION-DOLLAR SMILE FREE WITH EVERY 10 CENTS' WORTH OF FRUIT

Italian boys tend their fragrant pushcarts, and mark down their prices as evening shadows fall. In and near Faneuil Hall and at adjacent Quincy Market, a spacious structure 535 feet long, Boston buys much of its food.



© National Geographic Society Finlay Photographs by Luis Marden

DRUMS! DRUMS! FOR BRASS BANDS, DRUM CORPS, AND SMALL BOYS EVERYWHERE

For generations kinsmen of the man at the left have made drums, played them, and taught drummers serving in the Revolution, the War between the States, and in the World War. Assembling an instrument in a Boston drum factory.



GIRLS IN EMERALD ISLE COSTUME STAGE FOLK DANCES ON THE COMMON

In Boston, noted for its many racial groups, the sons and daughters of Ireland are numerous. Early American families still cling to Beacon Hill and Back Bay, especially for winter residence.

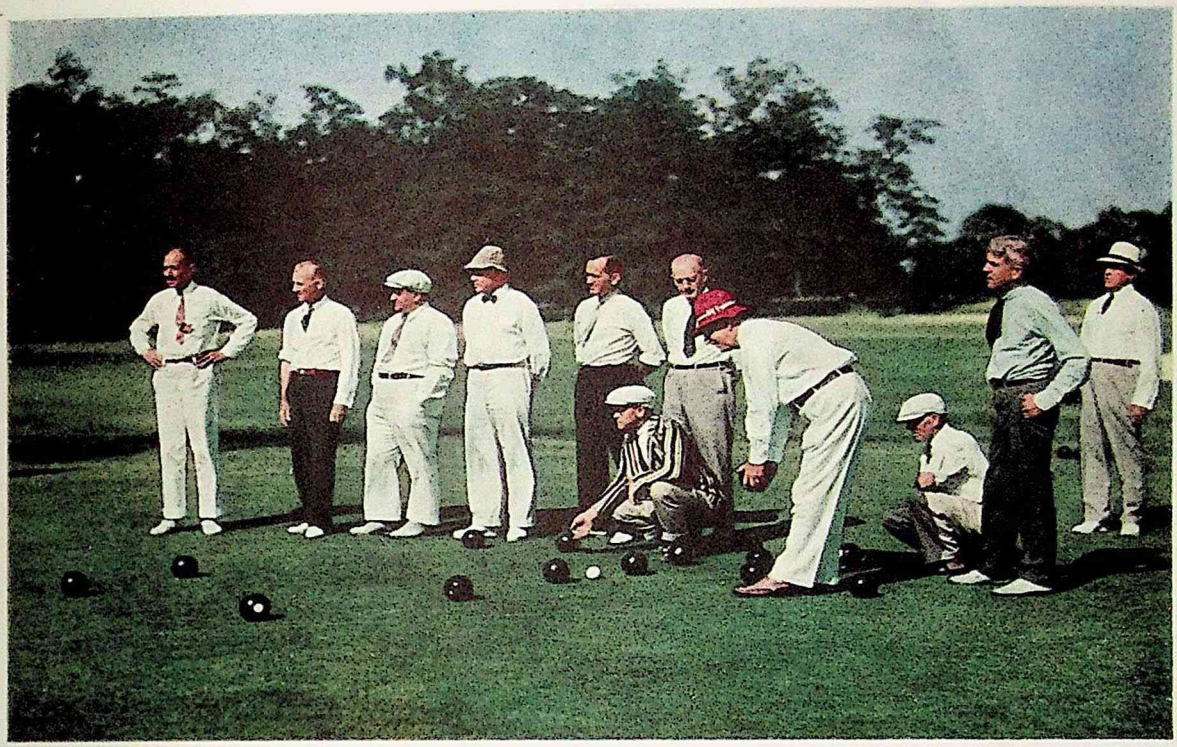


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Finlay Photographs by Luis Marden

DANCING A MINUET, A RE-ENACTMENT OF THE SPINNING BEE OF 1753

In 1634 this Common was set apart as a cow pasture and training ground. For generations it has been the scene of many exciting events in city and national history. Now, with its open-air oratory and concerts, its nursemaids, and noisy small boys, it is the Hyde Park (London) of Boston.



BOWLING IN BROOKLINE AT "THE COUNTRY CLUB"—FIRST TO BE FOUNDED IN AMERICA

More than half a century ago, when this club was founded for outdoor athletics, golf was little played, squash was hardly known in the United States, and tennis was in its infancy.

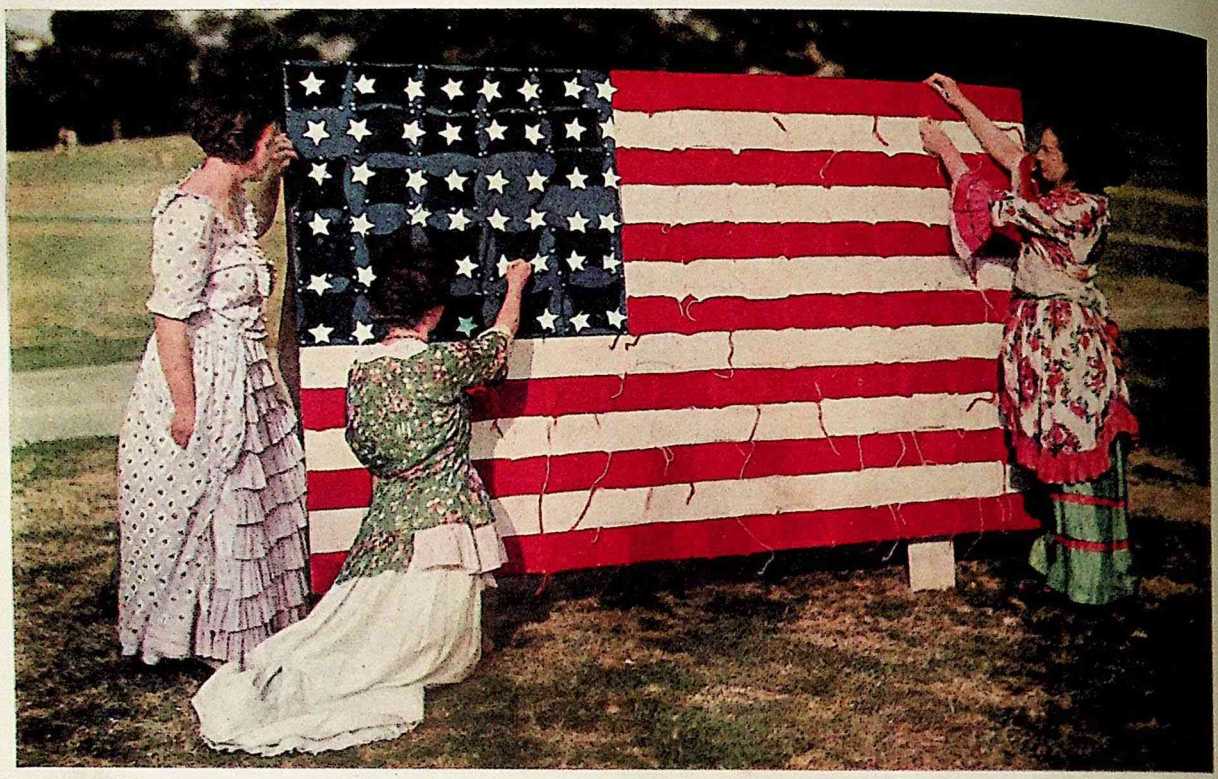


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SPINNING AND WEAVING EXHIBITS RETURN AGAIN AFTER NEARLY 200 YEARS

Boston papers of 1753 tell how interest in these arts was stimulated when in that year 300 young women brought their wheels to the Common and showed a huge crowd how to spin wool (Plate VIII). Containing about 50 acres of tree-shaded lawns, Boston Common lies in the heart of the city.



TWO HUNDRED WOMEN—AND THE LONE MAN—KNITTED THIS WOOLEN FLAG IN ONE DAY

Here three contestants pin the finished squares on a board to form the Stars and Stripes. In August, 1935, Boston staged an old-fashioned wool-working exhibit on the Common.



© National Geographic Society

Finlay Photographs by Luis Marden

BOSTON YOUNG LADIES MAKE THEIR NEEDLES FLY TO WIN THE KNITTING TROPHY

Even man competes in the background with the busy women, two of whom have nearly finished their sections that will form parts of a stripe in the flag above. Women's organizations founded spinning schools in Boston after 1720. Free wheels were supplied by the city. After one competition excited swains, becoming jealous, rioted over the spinning prowess of their dames.

all the skill and grim intent of adventurous clipper days.

Be asked to sail in Yacht Club races, especially if all your racing experience has been on the deck of a mustang, and you hear a new language. On the first day of "soft spots" in the air, of tacking, luffing, crossing of bows and sterns, and shutting off of the rival's wind, sailing seems a sport not only of odd speech but of mysterious motions (page 40).

Then, all at once, you begin to sense these tricks of jockeying with boats. Here *is* horse racing, but on water! Instead of crowding the other, riding in to the rail to slow him down, you shut off his breeze power. Ship lines are only bridle reins; stiff breezes are spurs, and letting out a spinnaker is merely giving your nag her head.

Fair play and good sportsmanship are ingrained. Inherited English ways and proximity of Harvard, with its generations of clean sport, have fostered this love for games (page 79).

Gymnasiums came early, where circus acrobats and strong men used to be invited to "show off" for the boys. That colorful character in prize-ring history, John L. Sullivan, was born in Boston. Cricket, hockey, boxing, rowing, swimming, high bicycles, and ball players in full beards, Boston fostered them all; yet permitted no league baseball games on Sunday till 1929!

Special "snow trains" leave now, taking winter crowds with skis, sleds, and toboggans, at the first news of heavy snows in the White Mountains. Born of the old East Indian battledore and shuttlecock, and introduced into England about a century ago by returning Army officers, the game of badminton is now also much played about Boston.

New among Boston sports is midget motor-car racing. She has a special Tom Thumb track, an oddly formed figure with seven turns. To it, on race days, tiny speed cars are hauled on trucks, for rough-and-tumble contests (page 60).

Instead of arresting people now who swim on Sundays, the city of Revere and the State jointly support a vast pleasure resort at Revere Beach. Here you can rent a locker and a bathing suit for 10 cents (page 61). After one Sunday's sport the city laundered more than 100,000 bathing suits!

The public playground, the Common, was once a cruel, mirthless place where men were whipped at posts and taunted in the stocks; where pirates and Quakers were hanged, and trenches dug for British soldiers killed at Bunker Hill.

CHILDREN FROLIC AND IDLE MEN SLEEP WHERE PIRATES USED TO HANG

Great trees shade the Common now, and on city-built playgrounds boys and girls of mingled races romp through their games (Color Plates VI-VIII). Along wide walks where Union soldiers marched off to war singing "John Brown's Body," first sung into popularity by the 12th Massachusetts Regiment, I saw Labor Day crowds gathering to hear speeches.

A band again played "America" within earshot of Park Street Church, where that hymn was first publicly sung (Plate XIV). Then a versatile Congressman put on the bandmaster's cap and led the band himself, while news cameramen shot him in many poses; election was coming.

Some rods apart from the official speakers' stand, the usual "agin-the-Government" dissenters harangued their little groups; a few listeners agreed, some grinned, and some scowled (page 82).

"If you don't like this country, get out!" some voices shouted.

"That's right," others echoed; and strolled off to watch the ball games.

Next day, after dawn, I walked again across the Common. In all directions men sprawled on the grass; there they had slept.

One near me opened an old suitcase to change his shirt. Then he reached for a discarded newspaper and read the headlines: "Labor Day Crowd Bets $1,787,261 on Races", "Total Bet During Meet Just Closed More than $12,000,000." Idly he scanned these lines, then crushed the paper and tossed it away.

Later that day, at the Essex Institute in near-by Salem, I thought again of those idle men on the Common. To look at the Museum's symbols of busy, thrifty pioneer life is to be impressed, profoundly, with the changes less than three centuries have brought.

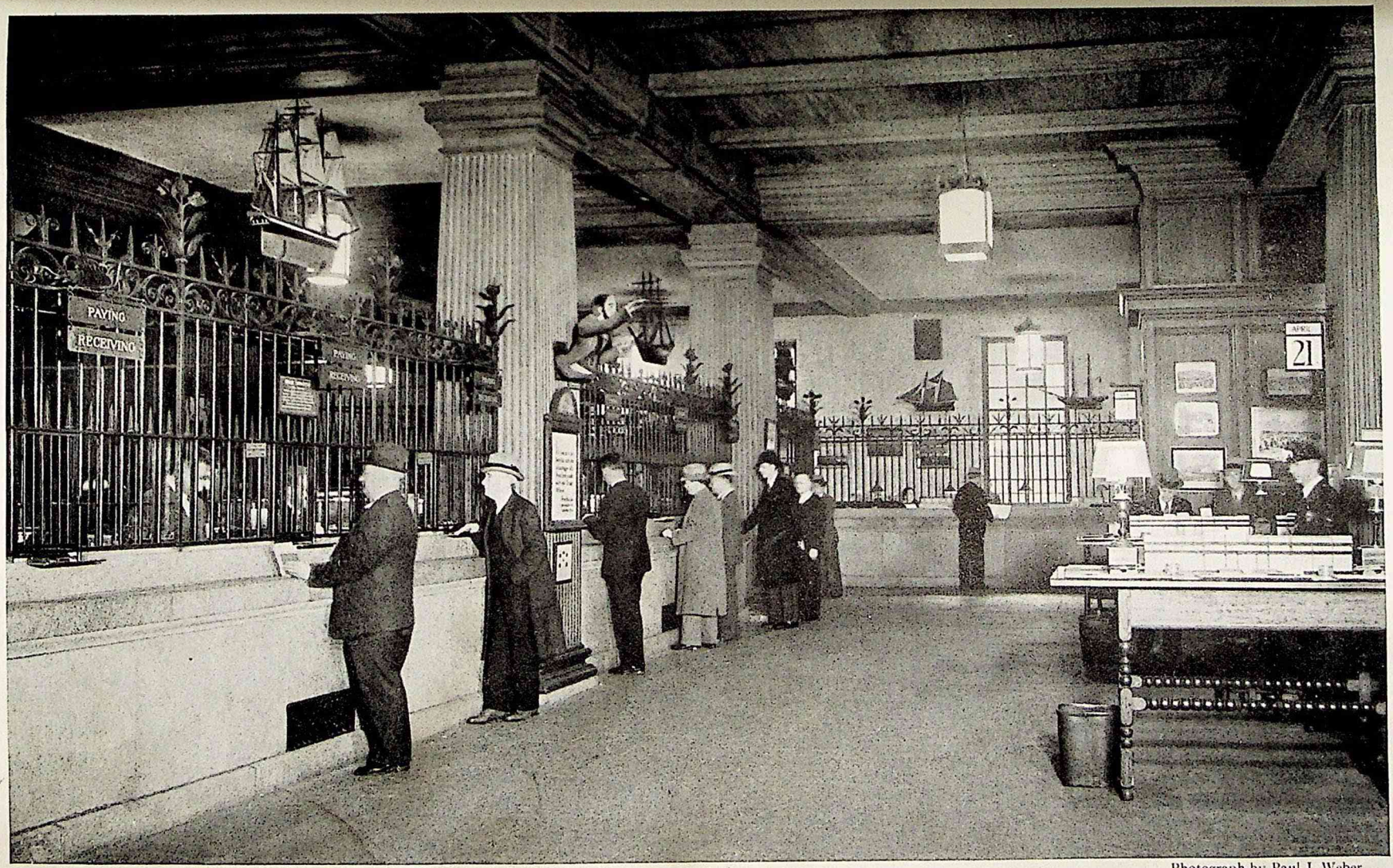
All these crude, hand-made tools, implements, utensils, vehicles, clothing, furniture, and toys prove how diligently *all* the early settlers had to work for life's needs and comforts. More things were



Photograph by Leslie R. Jones

ZEBRA-HIDE PATTERNS ETCHED ON CHARLES RIVER BASIN BY WAYWARD WINTER'S CAPRICE

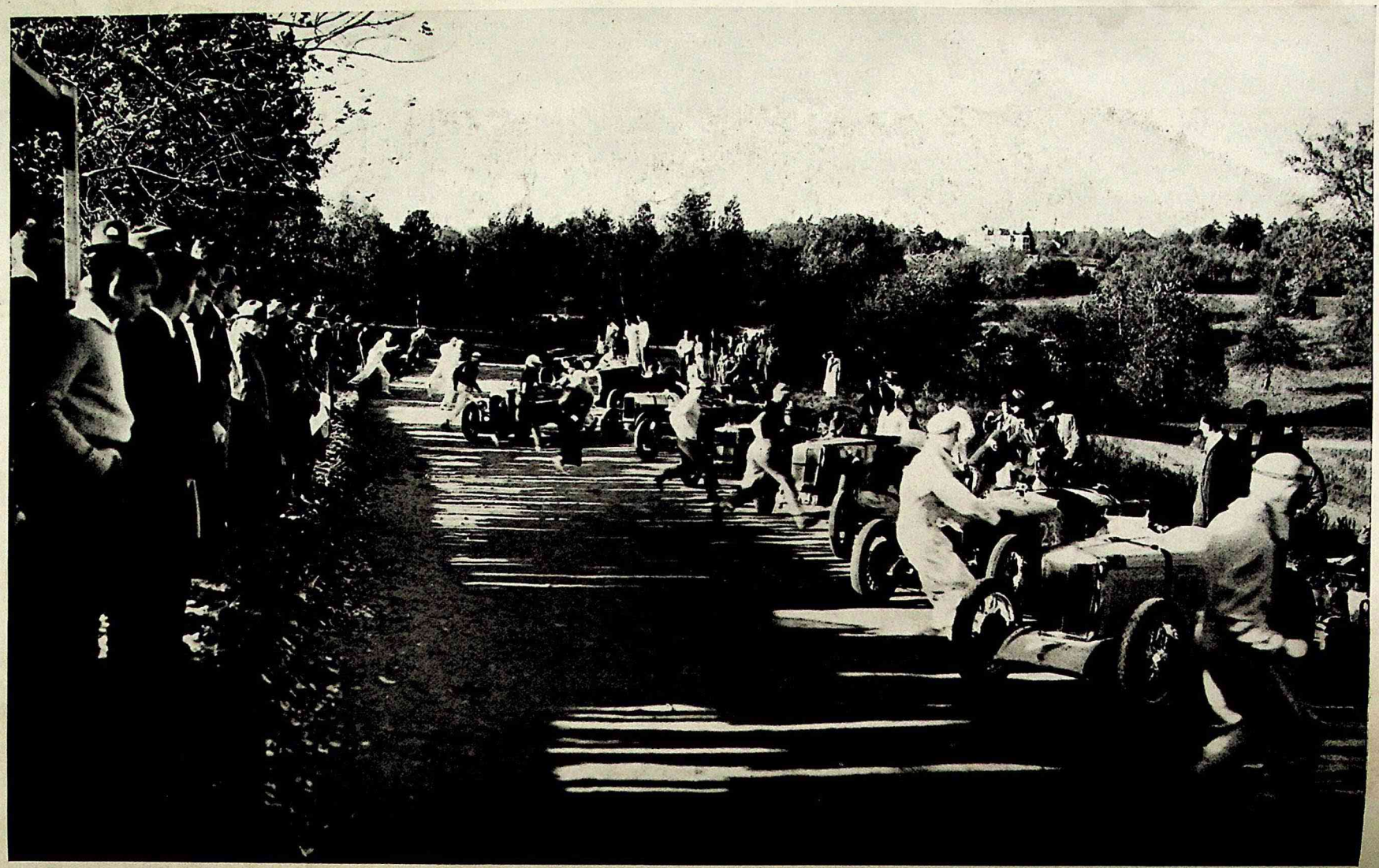
This unusual wavelike ice, not often observed on the Charles, was photographed February 22, 1929. The ice-breaking boat was used by the State to keep barge lanes open to the locks. The surface is smooth, but has a ruffled appearance when seen from above.



Photograph by Paul J. Weber

FAMED NEW ENGLAND VESSELS LIVE IN MINIATURE AT THE STATE STREET TRUST COMPANY'S MAIN OFFICE

A model of the whaler *Euphrates* hangs above the teller's cage, left. On the nearest column is a curious figurehead from the ship *Abraham Lincoln*, which was sunk off the coast of England. Lighting fixtures on the customers' desks are old whale oil lamps adapted for electricity, their shades decorated with reproductions of noted ships. Even the inkwells are original pewter ones from old English counting houses. Flagstones for the floor and counter were obtained at Hingham, Massachusetts, near quarries which supplied granite for many of Boston's historic buildings. "Cages" are made of hand-forged wrought iron of early Colonial design.



Photograph by Harris W. Reynolds

"THEY'RE OFF!" IN THIS ROAD RACE THAT BEGINS WITH A SPRINT AS DRIVERS DASH TO THEIR MIDGET CARS

The starter has waved his flag. Contestants, who were lined up across the roadway, scramble into their machines, motors idling. One driver leaps belatedly from the sidelines, while another has his car already under way. Starting positions are determined on a handicap basis, smaller cars being placed near the head of the line. This race is run on a "circuit" of winding roads on a private estate at Wayland, near Boston (page 57).



Photograph by B. Anthony Stewart

SWARMS OF HAPPY BATHERS CROWD REVERE BEACH, BOSTON'S CONEY ISLAND

Bathing suits are rented to the public by the city of Revere and the State, which jointly maintain this huge resort. After one busy Sunday, the city laundered more than 100,000 suits—in a locality where Sunday sport was once a crime (page 57). A boulevard and promenades, with roller coasters and other amusements, extend for about two miles along this wide beach on Massachusetts Bay.



Photograph by Richard W. Sears

AT BOSTON IN 1876 ALEXANDER GRAHAM BELL SENT THE FIRST MESSAGE BY TELEPHONE

"Mr. Watson, come here, I want you." With these now historic words, Dr. Bell summoned his assistant by telephone in this building on March 10, 1876. Here, forty years later, on March 13, 1916, the inventor of the telephone and Mrs. Bell attend the unveiling of a memorial tablet commemorating the momentous invention achieved in this building on Exeter Place. Second president of the National Geographic Society, Dr. Bell was a trustee of The Society until his death in 1922 (page 76 and Plate XI).

wanted than there were hands to make them. From this necessity came inventions; shoe machinery, the cotton gin, mechanical wool combers, all New England's complex factory life.

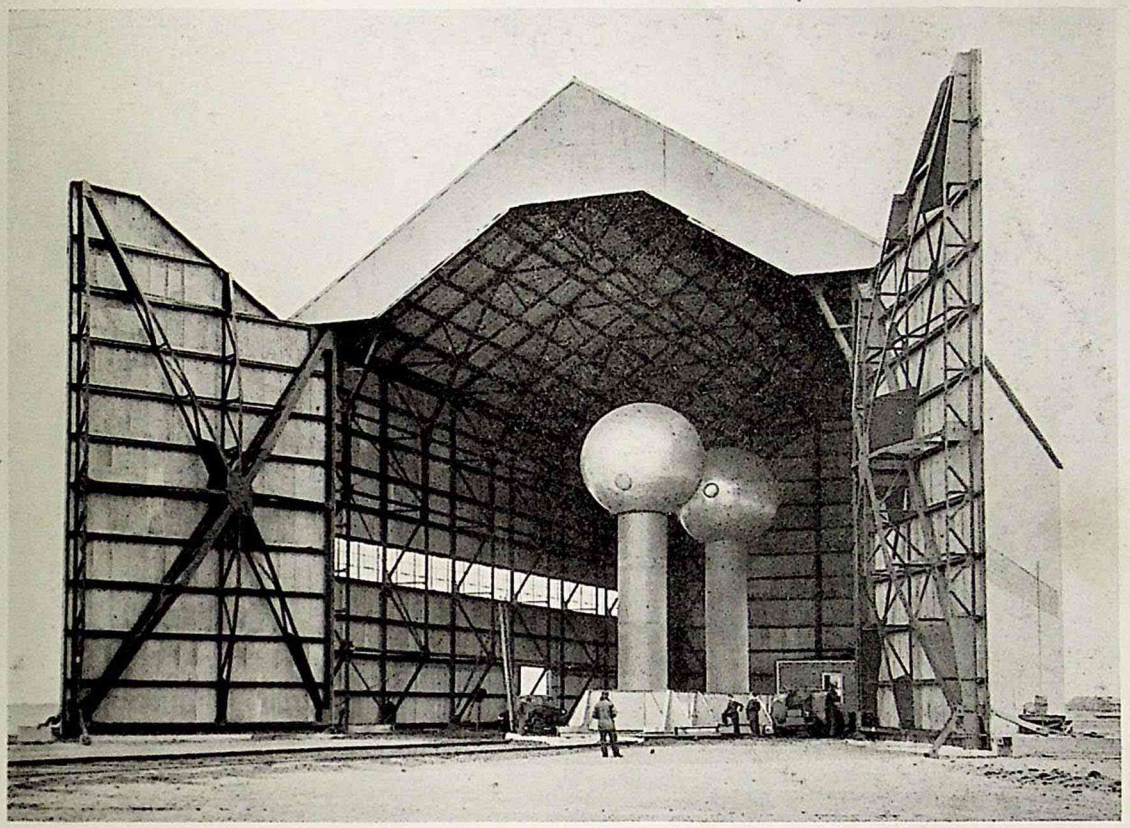
For busloads who daily visit these historic shrines about Boston, here is visual, fascinating evidence of how their ancestors lived and fought, by land and sea.

How pirates were outwitted, whales killed, wars waged, privateers launched, trade carried on with China, and how New England became mistress of the seas are all graphically shown in the matchless seafaring exhibits of Peabody Museum, also at Salem.

Here, too, is the visual story of life in the Far East, a century or more ago, as these Yankee skippers found it. Besides its amazing show of ship models, pictures of historic clippers, and crude paintings of Canton and Shanghai homes of exiled Boston and Salem traders of long ago, to this museum have been added rare life-sized ethnological groups, collections of oriental art and handcraft, boats, weapons, dishes, jewelry, and wearing apparel.

How profitless a walk out to Salem's "Gallows Hill," where a few "witches" were hanged, compared with a silent, vivid hour, imagination at play, among these wonders of bygone ways and days!

Follow the route of Paul Revere's ride, if you will, and see Lexington, Concord, and that bridge where patriots fired "the shot heard round the world." But never with the Boston Sunday crowds! The road becomes a river then, a thick sluggish stream of crowded busses, family flivvers, "foreign" cars with Iowa or Utah license tags, motorcycles, and fat girls in shorts walking, reducing.



Photograph courtesy Massachusetts Institute of Technology

ATTEMPTING A POWERFUL ATTACK ON THE ATOM, M. I. T. BUILT THIS DIRECT CURRENT ELECTROSTATIC GENERATOR

Using voltages up to 10,000,000, electrical "bullets" flying 100,000 times faster than the swiftest rifle bullets will be fired at atoms to smash their cores, or nuclei, in which vast energy is believed to be locked up. Could this power be released, it is estimated that the atomic energy in a single lump of coal might drive a steamship across the Atlantic. If they can learn how the cores of atoms are put together, scientists will be nearer to solving the secret of how the universe is constructed, for everything is composed of atoms, from human beings to the distant stars. This generator is housed in an airship dock. The giant spherical terminals are 15 feet in diameter and the units are 45 feet high, weighing 16 tons each.

Slowly, often in second gear, the big parade moves past the Minute Man Cafe, past an advertising effigy of Paul Revere on a galloping wooden horse; through blue smoke, the smell of hot rubber, hot oil, hot dogs, and coffee, mixed with gasoline and whiffs of roadside onion stew, fruit stands, and cheap perfume.

Beside me in the bus was a Texan. "Paul could never have made it on a day like this," he growled.

BOSTON REVIVES AN ANCIENT ART

For more than a century after the Pilgrims landed, many New England settlers had not even seen a windowpane. They weren't imported, for wide use, until about 1829.

Yet, some 800 years earlier, most elaborate windows of stained glass for cathedral use were made in the Old World.

Today, in Boston, this art has been revived. Medieval craftsmen who made the famous cathedral windows at Chartres, Le Mans, or Canterbury, centuries ago, would feel quite at home in these Boston shops. One of them, could he return, might walk into a Boston studio and go right to work, for methods are changed but little.

Boston makes windows not only for churches and chapels all over America; she even sends them abroad, to the American Memorial Cemetery Chapel at Belleau Wood, France, and to the American Church in Paris.

All themes for windows are not ecclesiastical. Legend, romance, or even science are drawn on for secular themes that may

range from Tom Sawyer to Sir Galahad, as for windows in the playroom of a Cincinnati hospital; or from Euclid, "Father of Geometry," to Charles Darwin, the evolutionist, as in the chapel rose windows made for Colorado College.

For the Cathedral of St. John the Divine, in New York, one great window made here tells the History of Healing. The figures shown begin with ancient Imhotep, the early Egyptian doctor; then comes Hippocrates, and Avicenna, the Arabian physician. Pasteur, Lister, Florence Nightingale, and Edith Cavell are also shown. So is the Boston dentist, William T. G. Morton, who demonstrated the use of ether as escape from pain during surgery.

Larger medallions in this window show Christ miraculously healing the lepers, the blind and the halt, the raising of Lazarus, and the casting out of devils.

To make these often huge, heavy, and costly windows, artists first draw designs on small scale, after which the cartoon, or full-size drawing is made (Plate XVI).

From this a paper plan is copied and cut into pattern pieces, like a jigsaw puzzle; these patterns are followed exactly in cutting the bits of various-colored glass, whose correct arrangement forms the design, and which are held together by grooved strips of lead.

Workmen hundreds of years ago used almost these same methods, and knew perfectly the color values of stained glass, which, as some one said, can make the inside of a cathedral seem like a lonely forest at twilight.

Windows of the chapel at Princeton University are great epics of literature—"Paradise Lost," "The Divine Comedy," "Pilgrim's Progress," all as recorded in colored glass by a Boston artist.

MAKING A SILK PURSE FROM A SOW'S EAR

From this centuries-old art Boston takes a long stride to the magic of modern chemical science.

"We got 100 sow ears from a Chicago packer," said a chemist in the Arthur D. Little laboratories, "and made a silk purse. Here it is. No, it isn't very good silk, or very strong, but it *is* silk (Plate IX).

"How did we do it? Well, briefly, by finding out just how the silkworm does it. He emits a viscous liquid which, on reaching the air, turns into silk thread. That liquid, we found, was much like glue. So we took glue from a sow's ear, and sought to make it act just like the silkworm's fluid. The rest was straight laboratory work.

"We never intended, of course, to make silk from sows' ears to sell; we were only playing! There is more wood and cotton fiber at hand for making artificial silk than there are pigs' ears."

How to build better cedar chests, chests more discouraging to moths which now destroy each year more than $200,000,000 worth of our woolen clothes and rugs, was another riddle handed to the chemists. Solving it, they raised swarms of moths to study their diets, breathing habits, and reactions to poisons.

Mercury vapor, for example, though fatal to other forms of life, was found to stimulate moths, making them larger and more vigorous. But adequate vapor of cedar oil, as exuded from cedar wood, was found to kill the moth by harm to its skin and breathing machine.

Another odd task here has to do with smells.

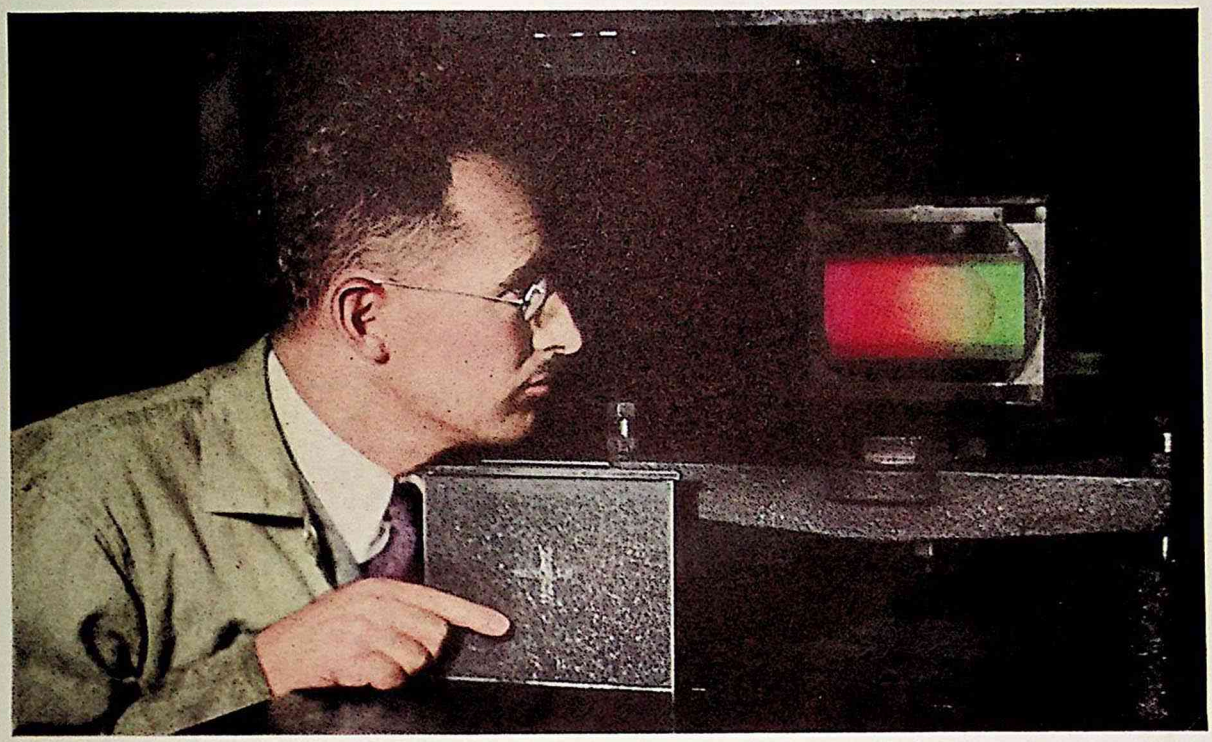
If you make glue, soap, or linoleum, or tan leather, run a fertilizer factory, or use a bookbinder's paste whose odor makes your workmen sick and drives customers away, these chemists will suppress it for you. Not only that, they can trade you a pleasant smell for that unwanted stench.

In working silk into stockings, for example, oil is added to make the silk more easily handled. Later this gets rancid. One hosiery maker, to overcome this, mildly perfumed the stockings. Then, by actual tests, kept secret from sales girls, it was found the scented stockings outsold the others by 34 per cent!

In the same way chemistry now supplies pleasing odors to cosmetics, soaps, and pharmaceuticals, as well as to manufactured foods and beverages. Without our sense of smell, these chemists say, apples, celery, and onions would all taste much alike.

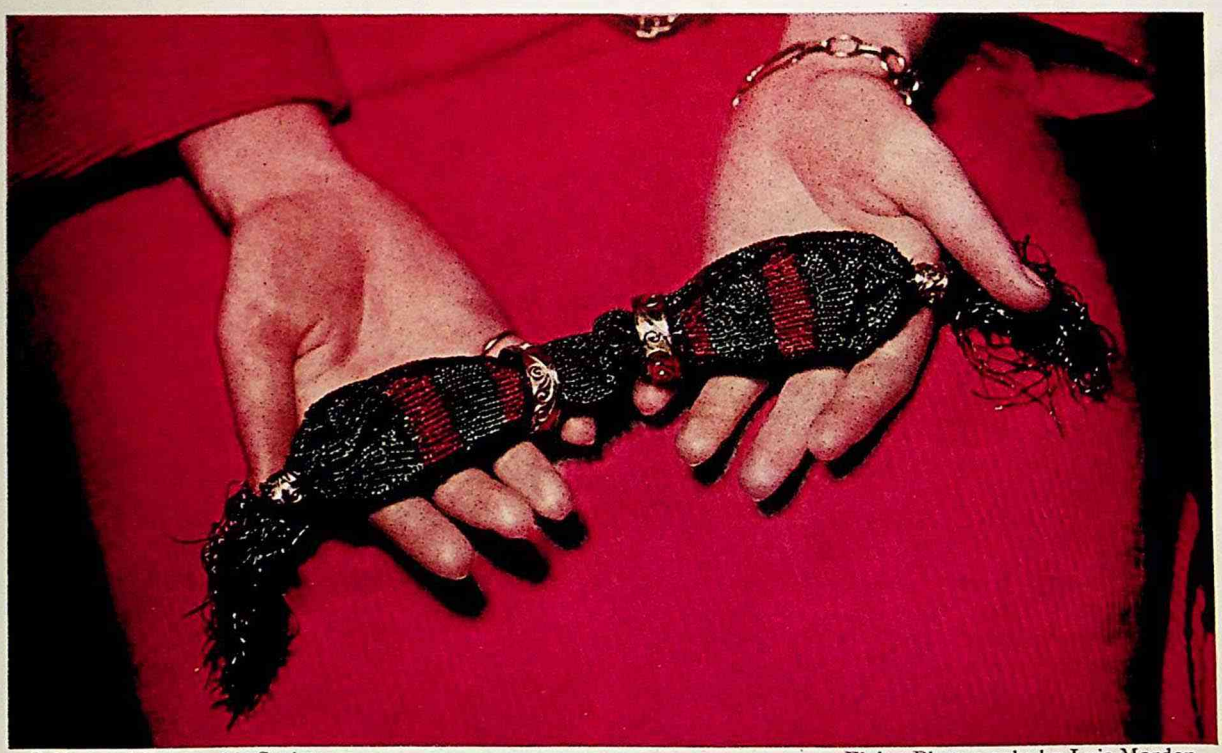
Fragrant, acid, burnt, and caprylic (goaty) are the four basic smells which the human nose can detect. With these come infinite combinations, of which a well-trained "smell expert" may identify upwards of 60 before his nose gets tired. (When such nasal nerve fatigue overtakes a perfumer, he sniffs some gum camphor to reawaken his olfactory senses.)

An ingenious chart shows the character



A BEAM OF LIGHT, BROKEN UP BY A SPECTROGRAPH, MAKES THIS ARTIFICIAL RAINBOW

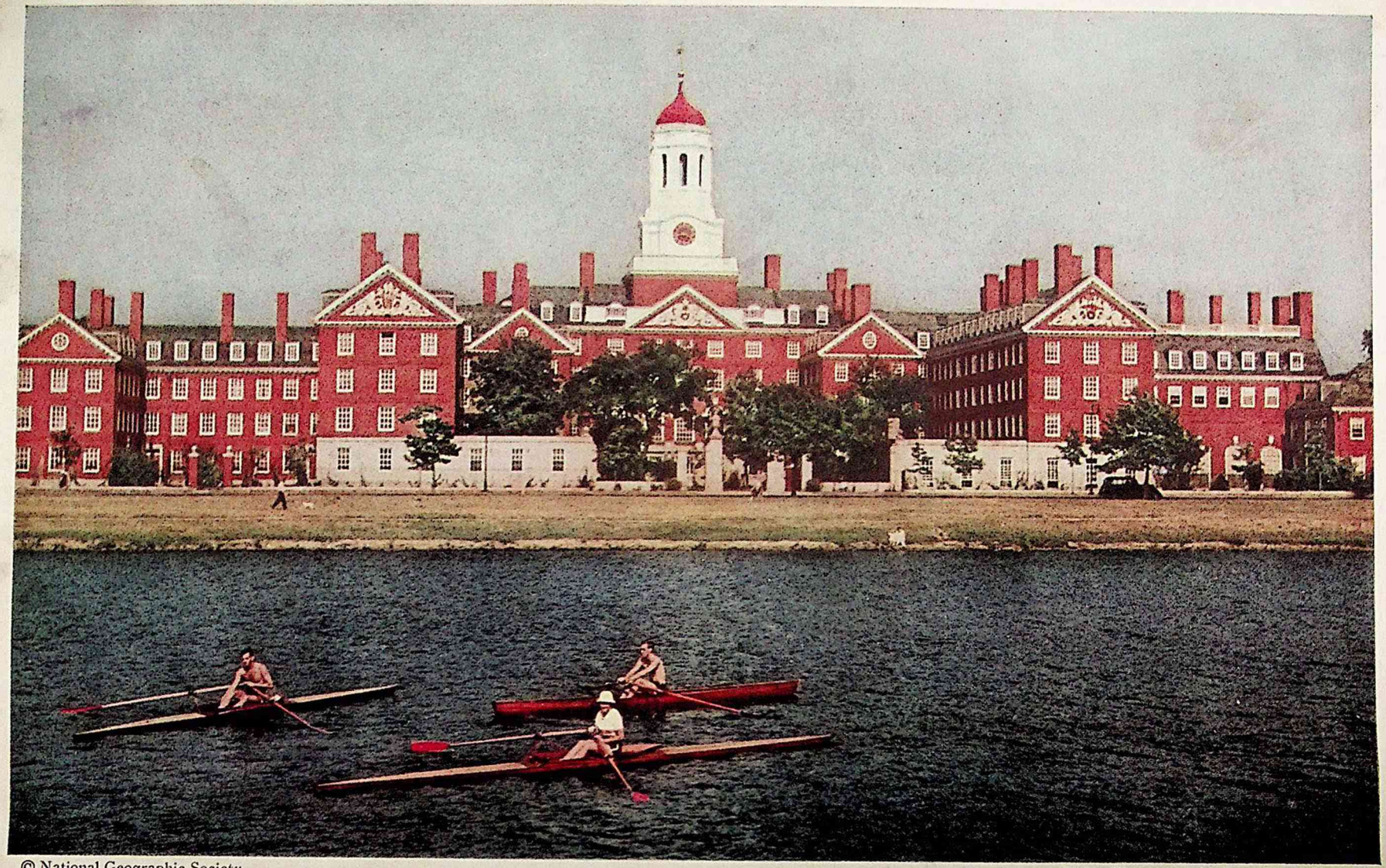
Its face highly polished and lined with microscopic grooves, the mirror spreads a band of light, in which students at Massachusetts Institute of Technology distinguish more than 15,000 kinds of red and blue. On photographic plates, the mirror will register the unseen infra-red and ultra-violet light rays.



© National Geographic Society Finlay Photographs by Luis Marden

"YOU CAN'T MAKE A SILK PURSE FROM A SOW'S EAR"—BUT LOOK AT THIS!

Challenging that proverb, scientists in the Arthur D. Little laboratories ordered sows' ears from Chicago packers, compared their chemical structure with silkworm exudations—and so finally made this silk purse from a sow's ear.

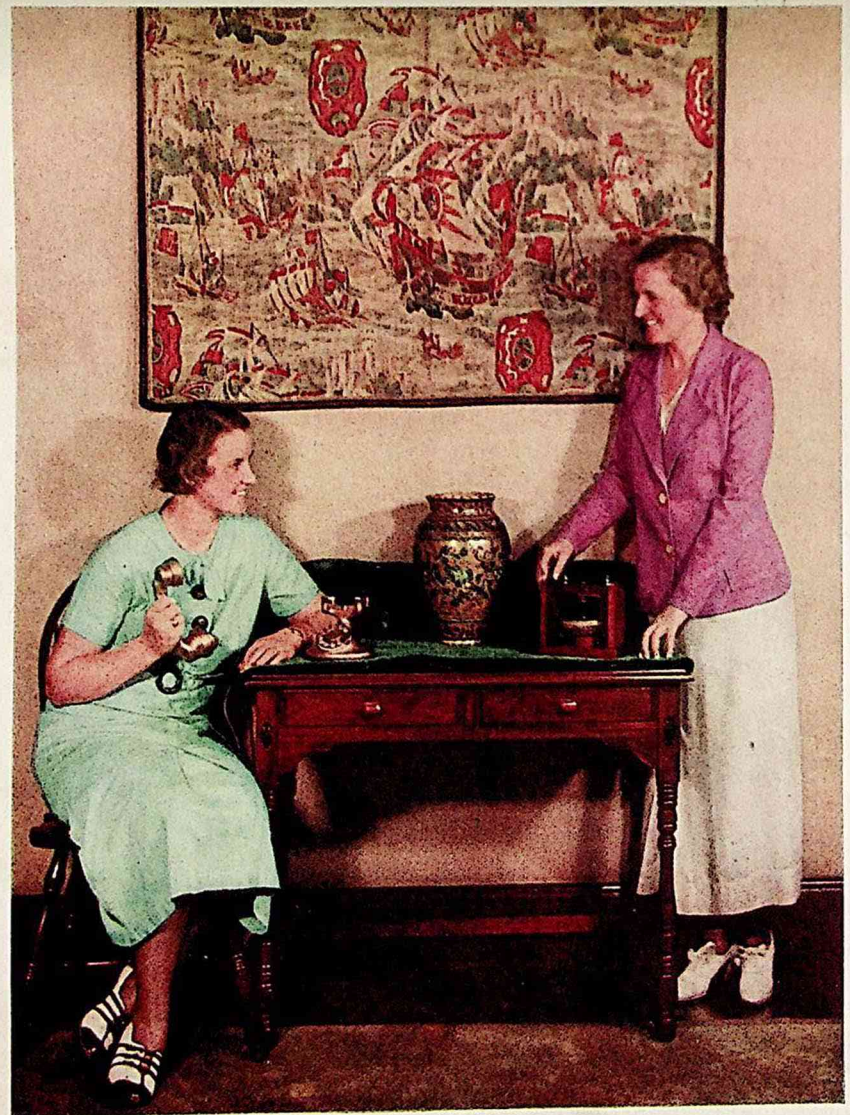


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Finlay Photograph by B. Anthony Stewart

BEFORE DUNSTER HOUSE, A HARVARD UNIVERSITY DORMITORY, SUMMER STUDENTS SCULL ON THE CHARLES RIVER

This year, 1936, marks the 300th anniversary of the United States' oldest institution of higher learning, founded by John Harvard. He was one of 35 graduates of Emmanuel College, Cambridge University in England, and came to Massachusetts in the Puritan migration. Earlier teachers were often paid in grain and wampum; once a goat was used as part of the pay due the president, but the goat died!



© National Geographic Society

THE ODD-LOOKING OBJECT IS A MODEL OF THE FIRST TELEPHONE

Compare the wooden instrument with the dial hand set. At Boston in 1876 Alexander Graham Bell, long a President of the National Geographic Society, invented the telephone. New England saw the origin and development of the first local and long-distance service.



Finlay Photographs by Luis Marden

"EVERY GEOGRAPHIC SINCE 1905" SAYS THE SIGN

This dealer keeps a list of copies on hand, classified by the year and country. From Emerson's day, Boston writers have frequented these second-hand bookshops along Cornhill. From far and near customers come or write for any book, from Gray's "Elegy" to "Mutiny on the *Bounty*."



ASTONISHING IS THE PRODIGIOUS GROWTH OF THE BANANA TRADE

As recently as the Philadelphia Centennial bananas were a rare tropical fruit, sold only here and there as an oddity, wrapped in tin foil. Now, with its vast plantations and "big white fleet," the United Fruit Company performs miracles of production and distribution.

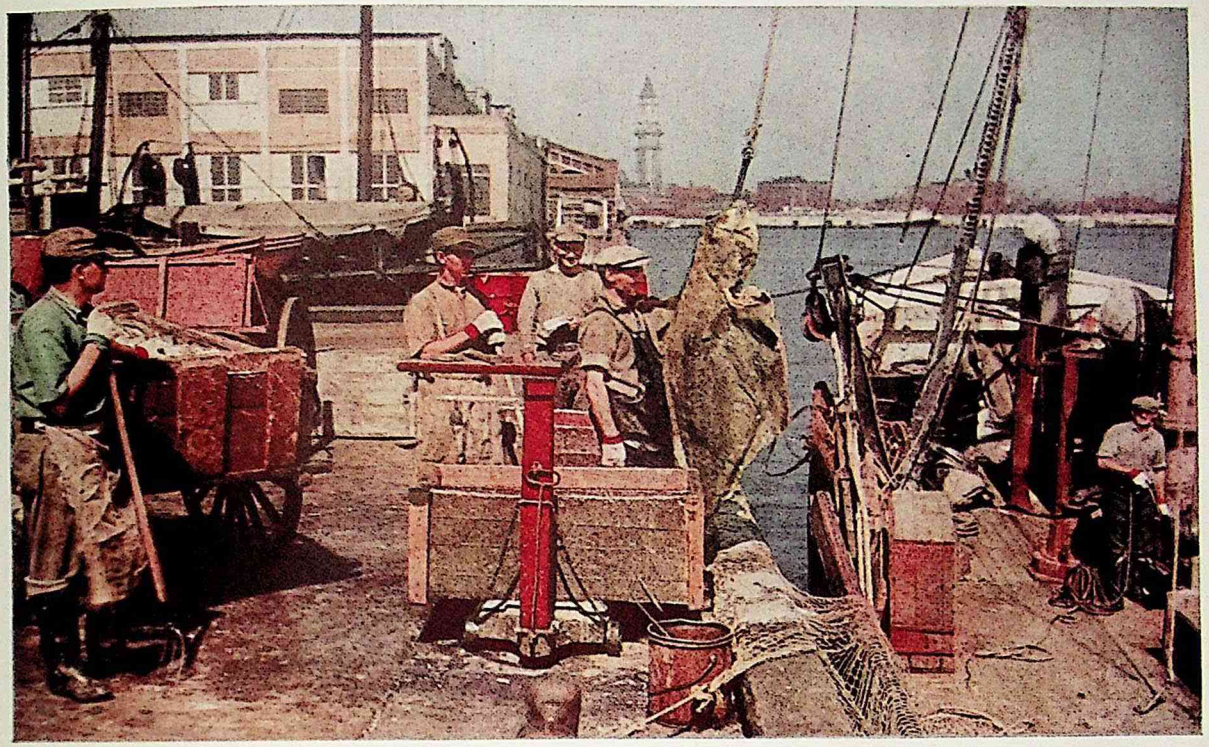


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Finlay Photographs by Luis Marden

AS FROM SOME COLOSSAL CORNUCOPIA, FRUITS AND VEGETABLES POUR INTO BOSTON'S "PETTICOAT LANE"

What with tropic fruits coming by steamer, Pacific coast products via the Panama Canal, and field and orchard crops by train and truck, Boston finds fruits "in season" the year round.



TRAWLERS UNLOAD A GIANT HALIBUT AT BOSTON'S INCOMPARABLE FISH PIER

Often in winter, these little ships come in from the Banks sheathed in coats of frozen spray. In the background rises Customhouse Tower. The man at the left, in boots, uses his pitchfork for tossing fish into pushcarts. Noisy early-morning fish auctions are held in a big hall on the pier.



© National Geographic Society Finlay Photographs by Luis Marden

HERE IS APPETIZING EVIDENCE THAT BOSTON STILL ENJOYS ITS TRADITIONAL TASTE FOR BAKED BEANS

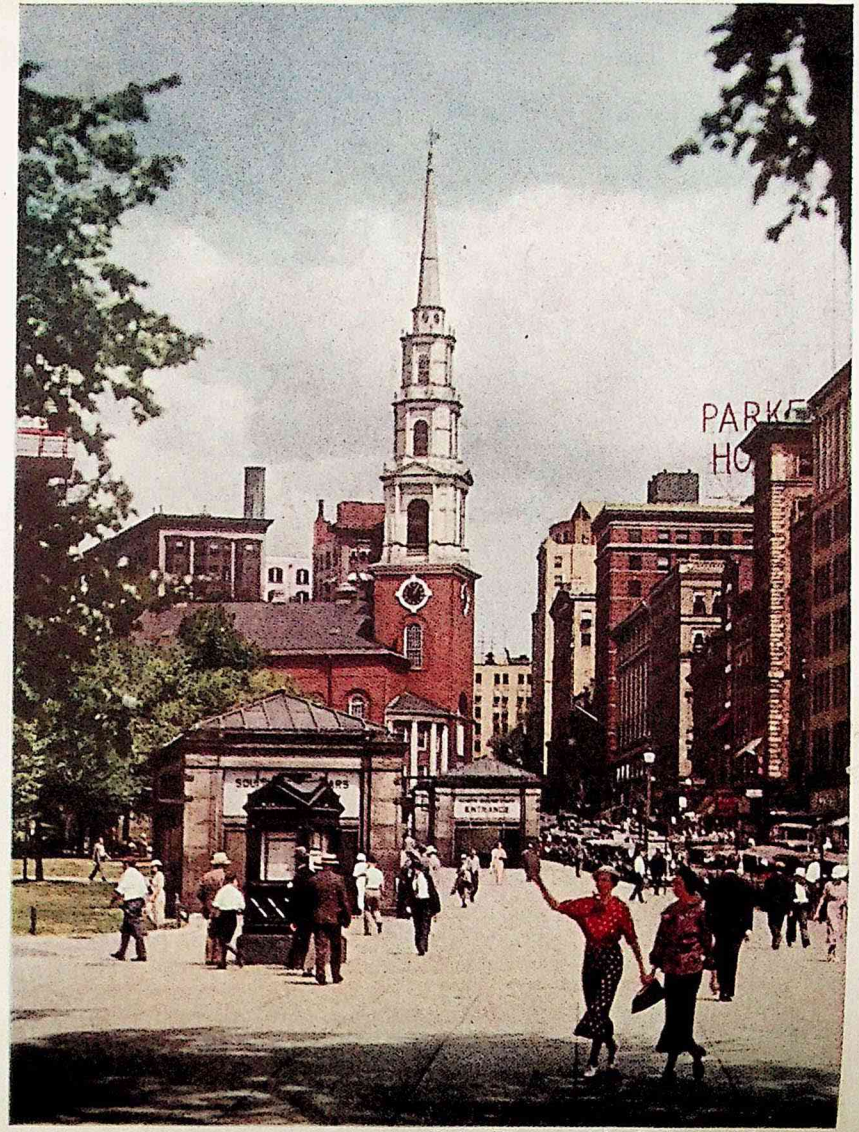
This ambrosial food factory in near-by Melrose also bakes the brown bread, every Saturday, that goes so well with beans at Sunday breakfast.



© National Geographic Society Finlay Photograph by Luis Marden

NOT PATRIOTIC SPEECHES BUT PUSHCART VENDERS' FERVENT CRIES NOW AROUSE ECHOES AROUND FANEUIL HALL

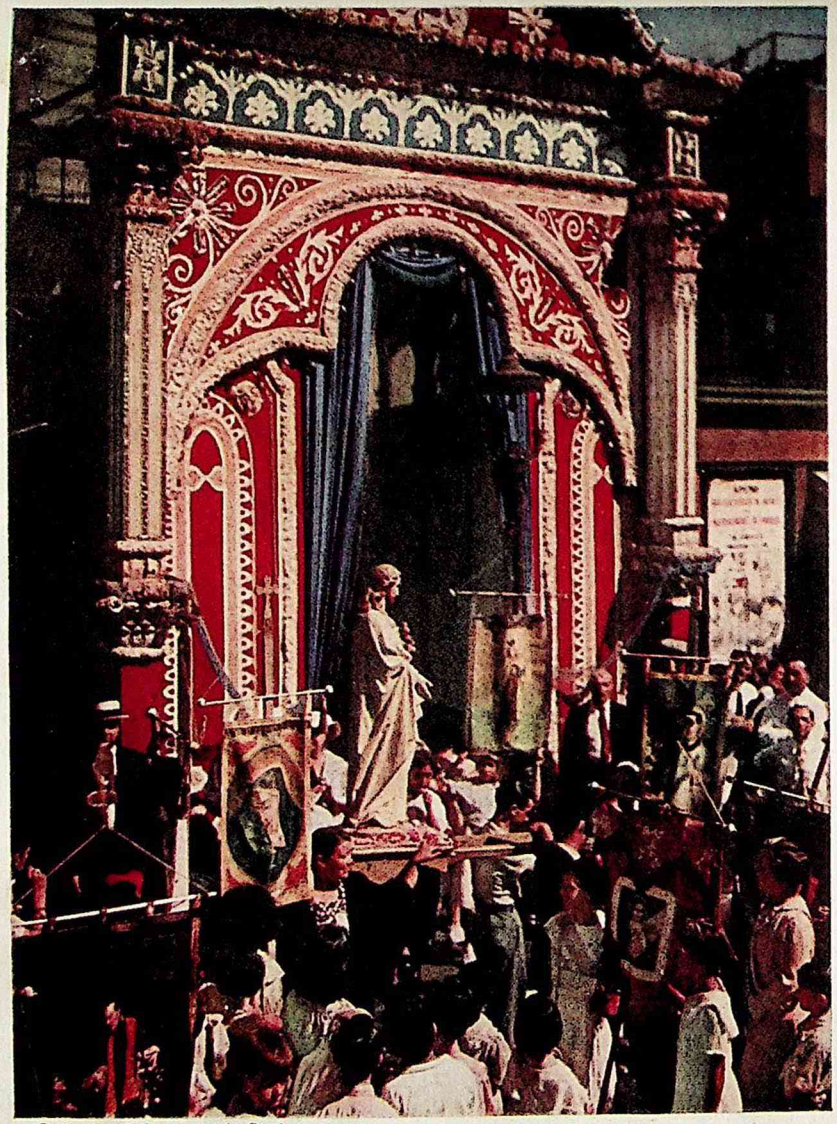
Fat green cucumbers, crisp and warty, are sold by Signor Passanisil In the background rises the Customhouse Tower, Boston's only skyscraper, which on clear days is a landmark for sailors far out to sea.



Finlay Photograph by B. Anthony Stewart

IN PARK STREET CHURCH THE NATIONAL HYMN, "AMERICA," WAS FIRST SUNG, JULY 4, 1832

Samuel Francis Smith wrote the song. *Busy Tremont Street, with churches and burying grounds flanking modern hotels and stores, is one of Boston's many reminders of London.*



© National Geographic Society

SHRINES ARE OFTEN ERECTED IN BOSTON'S "LITTLE ITALY"

Fishermen are prominent in these celebrations, when images of the saints are borne on men's shoulders through the streets. Spectators often rush up and pin dollar bills to ribbons that hang from the shrines.



Finlay Photographs by Luis Marden

OFFICERS OF THE "ANCIENT AND HONORABLE ARTILLERY COMPANY"

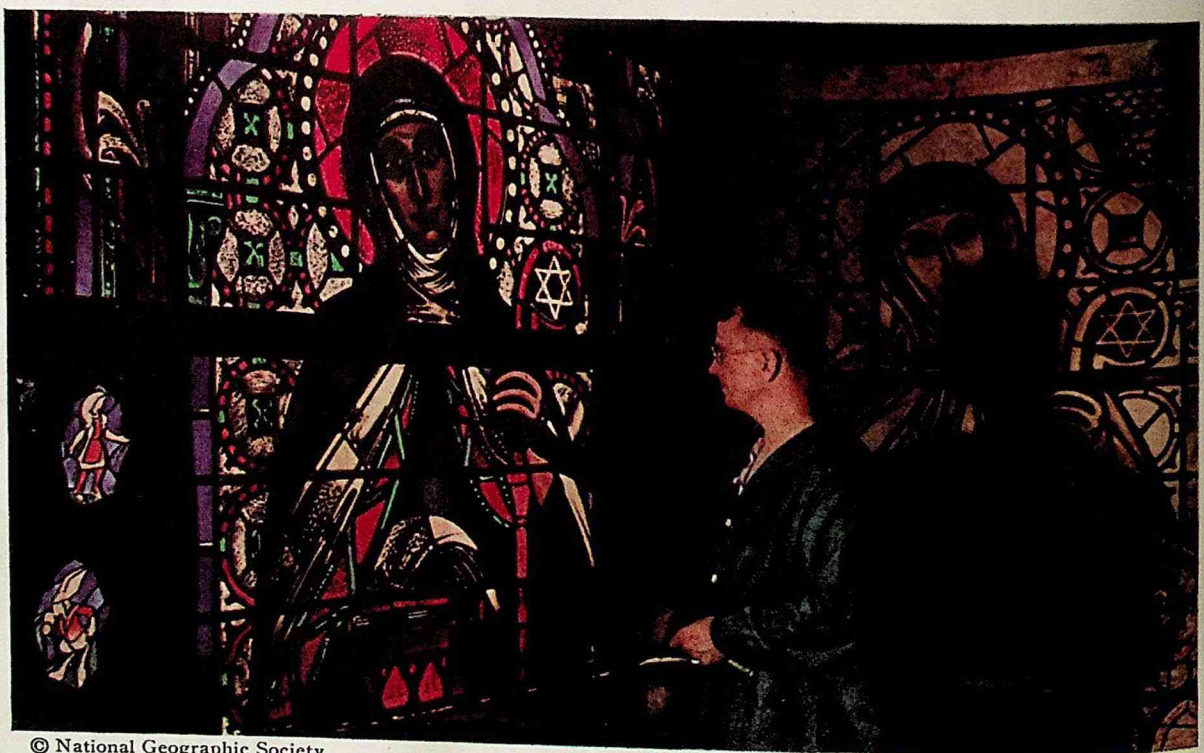
Faneuil Hall's first floor now is a public market. Upper rooms house the historic Company, named for the London organization. Here statesmen have made many speeches enshrined in American history.



Finlay Photograph by B. Anthony Stewart

ODD BOOTS AND SHOES FROM OLD TIMES AND FAR PLACES IN A BOSTON MUSEUM

The queer, feathery shoe (lower center) is worn by Australian aborigines to hide their footprints from enemies. The high boots are jack boots of the 16th century. Turkish sandals, right; Chinese mandarin slippers, left.



© National Geographic Society

Finlay Photograph by Luis Marden

AN ARTIST IN CONNICK'S STUDIO FINISHES A STAINED-GLASS WINDOW FOR THE CATHEDRAL OF ST. JOHN THE DIVINE, NEW YORK

Tacked to the wall at the right is the full-size black-and-white "cartoon" from which the finished window is patterned. Medallions, left, depict the "White Rabbit" and "Alice in Wonderland."

and source of various smells. When a certain smell is desired for use in a trade or industry, the chemist knows just where or how to get it.

In Boston today sulphuric, nitric, hydrochloric, and acetic acids, as well as alum, ammonia, salts, and other chemicals, are made for paper and textile mills, tanneries, etc. One chemical concern makes shoe polishes which sell all over the world; others furnish chemicals for factories making steam hose, bowling balls, and rubber rolls.

In the field of pharmaceutical chemistry, Boston has the great plant of the United Drug Company, now known as "Drug, Inc.," and other factories whose products are much exported.

Here the quick freezing of food was first accomplished; here are made sugar-of-milk, cod-liver oil, and disinfectants, and here is one of the world's largest soap factories.

THE HARVARD TERCENTENARY

In September of this year Harvard University will celebrate the tercentenary of its founding, when, on September 8, 1636, the Massachusetts Bay Colony appropriated £400 toward a college which should educate "English and Indian youth in knowledge and Godliness" (Plate X).

America's first college lecture on electricity was given at Harvard in 1746 by Professor John Winthrop.

Harvard's Blue Hill Weather Observatory was founded in 1884. Here the first recording instrument was raised by a kite. Samuel P. Langley and Orville Wright came to study these kite findings. At the St. Louis World's Fair in 1904, the Harvard Observatory initiated in America the use of weather-sounding balloons.

For more than fifty years Harvard has been noted for its study of the heavens; it has made more than 400,000 celestial photographs, and has led in work on star clusters, star brightness, Magellanic Clouds, and the galactic system.

In chemistry, Harvard laboratories determined the atomic weights of more than half of all known elements; led in the manufacture of organic compounds; developed the methods and apparatus, now in use the world over, for precise work in chemical analysis, calorimetry, and electrochemistry.

X-rays, acoustics, spectra, radio waves, high pressures, cosmic rays, radioactivity and thermodynamics have been subjects of major research at Harvard, to the advancement of science.

In geology and volcanology Harvard has made field studies in six continents and the islands of three oceans.

PIONEERS IN RESEARCH

Early American development in many phases of science is attributed to Harvard men: Agassiz in zoology and geology; Gray in American flora; Goodale and Farlow in botany; Cooke and Gibbs in chemistry; Wyman in anatomy; Whitney and Shaler in geology; Peirce in mathematics; Jackson in paleontology; Sabine in physics; Pickering in astronomy; James and Münsterberg in psychology.

Anthropology in America owes much of its growth to Harvard, which has carried on field research throughout the world, notably, in earlier days, in Central America and New Mexico.

The Gray Herbarium, founded in 1864, has 850,000 sheets of specimens of plants and ferns, most nearly complete of any collection. The Harvard forest of 2,100 acres is our oldest scientifically managed forest research tract. For more than a century Harvard's botanic garden has been a living museum of plant forms. Harvard's Arnold Arboretum, founded in 1872, contains about 5,000 kinds of trees, shrubs, and plants grown in the open air for research.

Asa Gray, of Harvard, America's greatest botanist, from the time he became a professor at Harvard in 1842, until his death in 1888, developed a system whereby surveying parties, pioneer observers, members of exploring expeditions, Army men at frontier posts, and others who went into the American pioneer country of that day sent him botanical specimens. Thereby Gray studied and named thousands of American plants.

Harvard's medical school men recognized and named appendicitis, devised the first baked dressings, suggested sterilization of milk for infants, determined the value of bacteriological examination of throat cases in diphtheria, devised serums and muscle-training treatment for infantile paralysis, and discovered the liver cure for pernicious anemia.

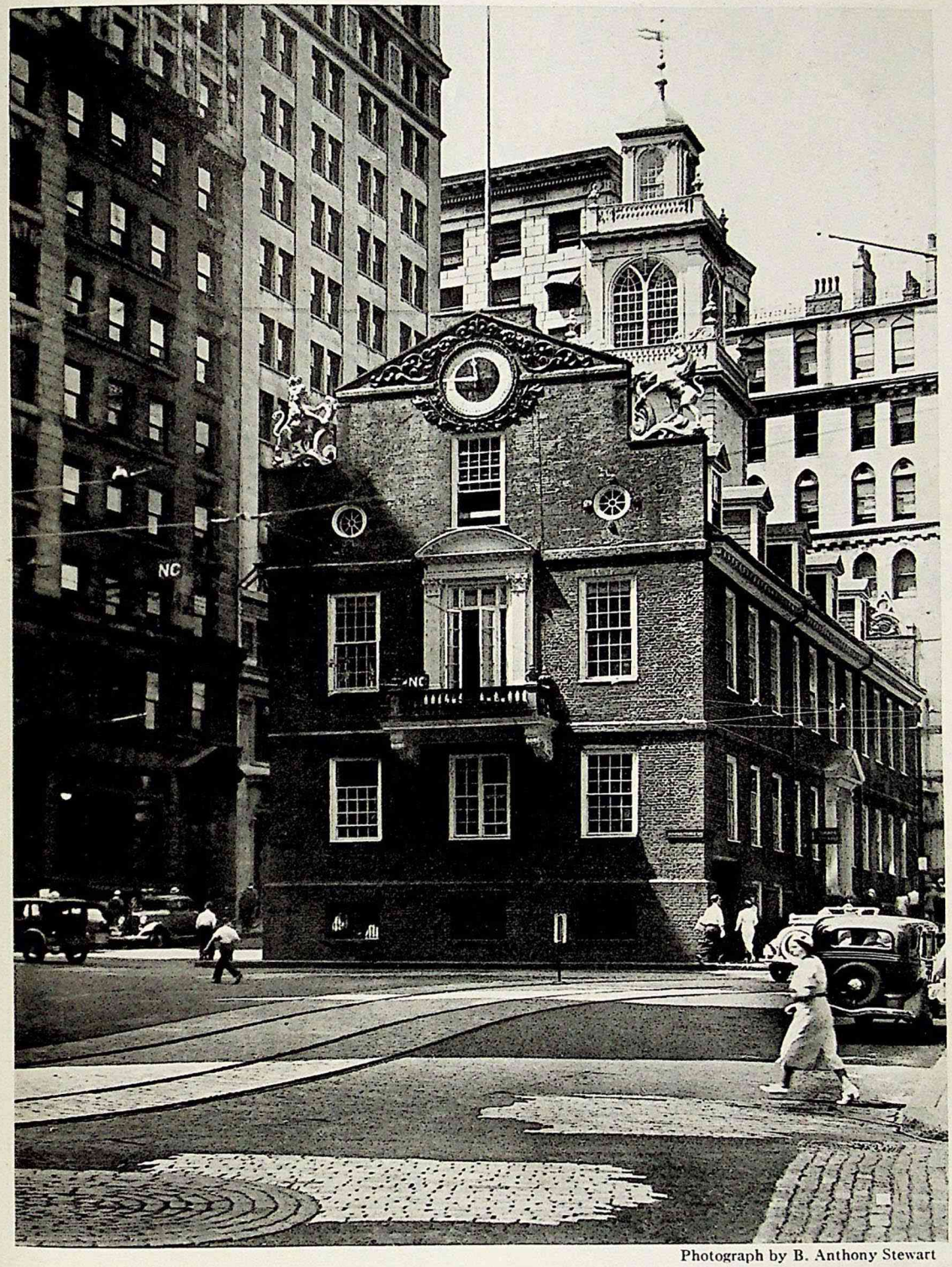
On the development of chemical engineering, Massachusetts Institute of Technology is having profound influence. Its chief aim is to train young men, with books and in laboratories, for industrial research.



Photograph by B. Anthony Stewart

OLD SOUTH MEETINGHOUSE IS A LANDMARK OF PRE-REVOLUTIONARY DAYS

Built in 1729, the brick church was used for patriotic gatherings as well as religious services. Its original hand-carved pews were designed to squeak, tradition says, so that no one could arrive in church unnoticed. Dwarfed by modern buildings, "Old South" has been restored and serves as a museum. Benjamin Franklin was born at noon on January 17, 1706, and his mother brought him to be baptized that same afternoon in a church on this site.



Photograph by B. Anthony Stewart

IN THE OLD STATEHOUSE BRITISH GOVERNORS HELD COUNCILS IN COLONIAL TIMES

On this site the first Town House was built in 1657. Here also stood the pillory, the stocks, and whipping post. Bostonians first heard the Declaration of Independence when it was read from the balcony under the clock. Royal symbols, the lion and unicorn, still ornament the façade. Exhibited inside are Franklin's old printing press, models of historic New England ships, and other relics of earlier days. The circle of cobblestones in the pavement marks the site of the Boston Massacre.



Photograph by Harris W. Reynolds

OVER THE HEDGE FOR A PERFECT TWO-POINT LANDING!

Hard-riding steeplechasers spur their mounts along the course at The Country Club in Brookline, near Boston, during the Eastern Horse Club Race Meeting of 1935 (Color Plate VII).

Constantly its instructors are being lured away by private industries.

From the Institute have also come many of the Nation's authorities in aeronautical engineering, including famous Army and Navy pilots, designers, and scientific research workers.

During the World War the great plants of our Chemical Warfare Service at Edgewood Arsenal were developed by a scientist from the Institute. To its laboratories, with their trained staffs and special apparatus, private industries may, under certain conditions, bring their problems. This plan aims at a closer relation between technical schools and business, a plan which Europeans have used successfully.

Pure water, milk control, food and drug analysis, sewage disposal, and many other problems of bacteriology vital to daily life have been among the grave tasks faced by the scientists of Harvard and Boston Tech.

THE BIRTH OF THE TELEGRAPH AND THE TELEPHONE

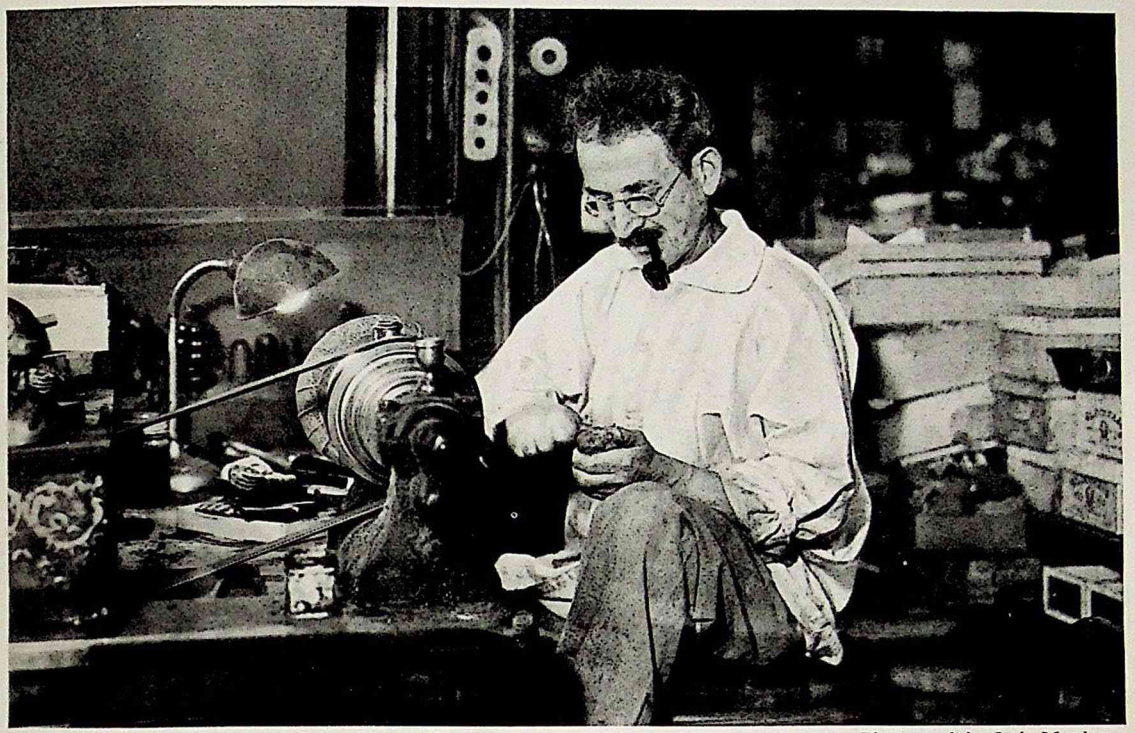
Born at Boston, near where Benjamin Franklin was born, Samuel F. B. Morse took electricity, till then but a scientific toy, and made it carry messages over wires. Alexander Graham Bell, a generation later, while teaching here at schools for the deaf, gave his telephone to the world (page 62).

Here the first research laboratory of the American Bell Telephone Company was established. Boston remained the world center of telephone development until the American Company joined with the Western Electric Company to open a joint laboratory in New York.

More than a score of laboratories are busy in Boston today, investigating the problems which arise among the plants which own or patronize them. One of these early laboratories put the sulphite process, which helps turn wood into paper, on a sound manufacturing basis.

Here in Boston was developed the safety razor, now scattered so thoroughly over the world that its inventor's name and face are known to as many people as those of any mortal who ever lived!

In tanning hides and making shoes, chemistry and mechanical genius are so closely linked in New England that all the world looks to Boston now for shoemaking ideas. King Edward VII used to have his shoes made in Massachusetts, though now modern shoe machines, made abroad



Photograph by Luis Marden

A PIPE-MAKER CARVES A GROTESQUE HEAD ON BRIER OR MEERSCHAUM BOWL

He works in his shop window on Court Street, attracting sidewalk crowds. One Boston store employs a craftsman who has carved pipes for 70 years. In another establishment they say jokingly: "A man is on trial until he has been here 25 years" (page 37).

under American patents, are used to fashion shoes in England and many other foreign lands.

Until the Civil War all shoes were made by hand, and tools had changed but little since Pharaoh days. Now 154 different machines may be used in making a single shoe! It is true that before the Civil War a few machines, helpful in making shoes, like Howe's sewing machine, had been invented; but their use was restricted. Only when war came, with sudden demand for army shoes in prodigious quantities, did men turn to the new machines.

Man's genius in making metal fingers do the work of human hands is a fascinating story in the annals of invention, too long to tell here. Yet had not Massachusetts' brains and capital produced the modern shoe machines, it would require the steady work of all the men in one of our largest cities, even if they were trained shoemakers, to make by hand all the shoes our machines now turn out.

Since pioneer farm boys cut wooden pegs on winter nights, the modern shoemaking machine, born of infinite experiment, has grown up to serve the whole world. Its development led to that colossal enterprise, the United Shoe Machinery Corporation, whose giant building towers over Boston. Out at Beverly is its factory, so vast that one walks six miles merely to pass through it.

Nothing at Beverly astonishes the visitor so much as the lathe on which lasts are turned. It can also make decoy ducks, golf clubs, gun stocks, ax helves, and wooden Indians (page 46).

Put any solid-wood model that is to be copied on one end of the lathe and set the sensitive wheels that guide the knives; put a rough block of wood on the other end of the shaft and turn on the power. Before your eyes, faster and more accurately than human hands could do it, the machine makes a perfect copy!

A MUSEUM OF HISTORIC SHOES

But it is the museum of some 2,000 old shoes in the main Boston building that most visitors wish to see (Plate XVI).

Here is an Egyptian sandal plaited from papyrus leaves long before Christ. Here are jousting boots worn by Henry IV of France as part of his armor, and postilion

boots worn in the days of Maria Theresa, so heavy that they were fixed in the stirrup and not worn when dismounted, but used merely to protect the right leg of the driver from the off horse.

Here are ceremonial clogs from Japan eight inches high, gaudy mandarin boots with thick soles made from layers of rice paper; highly ornamented Turkish slippers with long upturned toes; 16th-century jack boots from Boyne Castle in Ireland.

In this museum, in fact, is every conceivable kind of footwear the world over, even to the peculiar basketlike shoes worn by Australian bushmen, made from twisted hair cord and emu feathers so that no distinct footprints may remain by which an enemy might track the wearer. Everything, that is, except the seven-league boots of fiction, the winged sandals of Mercury, or that tiny slipper lost by Cinderella.

HERE IS THE BUSIEST WOOL MARKET IN THE WESTERN HEMISPHERE

Summer Street, Boston, is the heart of the greatest wool market in the Western World. In huge buildings here so much wool is stored that even the offices smell of it, pungently, like sheep corrals.

From here buyers go not only to our South and West, but to the wool centers of South America, Australia, New Zealand, and Tasmania. One buyer, just back from Patagonia, escorted me through a vast warehouse whose floors were piled with hundreds of tons of wool stacked solid, like lumber. He could tell by looking at a wool pile what country it came from. One stack was from Iceland (page 45).

"No," he said, "there is no fire risk; wool is hard to burn. But moths get at it if it is stored too long.

"America uses about twice as much wool as it raises; in fact, we grow less now than we did 30 years ago. About 25 per cent of all we grow comes now from Texas. That's not counting the mohair, or goat. In the last 20 years, the Texas wool clip has increased about 1,000 per cent.

"Dirt is the wool buyer's nightmare, for wool shrinks so much in scouring. Some wool from the red, sandy deserts of the Southwest will shrink as much as 72 per cent when washed. To scour 100 pounds of this dirty, greasy wool means you will have left only 28 pounds of clean wool. In buying from the grower we have to pay spot cash, and so we pay for the dirt and grease; hence the buyer's judgment must be accurate, when he fixes the price, as to how much the wool will shrink."

Besides dirt, they often find strange things in bags and bales of wool: shears, pieces of chain, lunch buckets, rocks, put there to make it weigh more; pieces of clothing, notes, a watch, and on one occasion a black man's hand.

A buyer who knows the range that sheep run on can tell fairly well by the look and smell of the wool, even before he handles it, what the shrinkage will be. Mohair is a chief component of universally popular Palm Beach suits, coach seats, and imitation caracul fur. Dyed and sheared close, mohair has a luster like fur; many so-called "fur" coats are really made of goat hair.

The wool trade is one of the world's oldest. The Bible says God prospered Job, and gave him 14,000 sheep, enough to make 20,000 wool suits for men! Some one has reported that there are 689,000,000 sheep in the world and 637,000,000 people in countries where wool is worn.

A silver service buried in the ruins of Pompeii was clean after 1,800 years, because it was wrapped in wool.

Babylonians wove robes of wool; and in 55 B. C., when Julius Cæsar invaded England, he found people there weaving both wool and flax. Alfred the Great, in 871, set all the women of his household to spinning wool; whence the term "spinster."

Distaffs and spindles were used till about 1530, when a baker invented the one-thread spinning wheel.

As early as 1643 a "fulling mill" for treating wool was built near Rowley, in Massachusetts. This State has never lost that lead; to-day the world's largest woolen mill is at Lawrence.

At the mills you see them making three distinct kinds of goods: woolens, worsteds, and felts. In making woolens, the fibers are carded together, but no effort is made to lay them parallel.

In worsteds the wool is combed to get a fine, smooth fiber; these are laid straight and parallel, in the form of a "rope"; this rope, or "top," is then drawn into smaller and smaller diameter and finally spun into yarn. The yarn is so carefully drawn that a pound of fine Ohio wool can be made to reach 16 miles without breaking.

"You can spin anything that has two



Photograph by T. F. Hartley

FOOTBALL FANS JAM HARVARD STADIUM TO SEE A GAME WITH DARTMOUTH

Soldiers Field, Harvard's playground (left), adjoins the stadium. Beside the Charles River is the University Boat House, left, used by varsity crews. Across the water, on the other side of the bridge, is the Weld Boat House. The Graduate School of Business Administration occupies the imposing buildings to the right of the football field. Most of the university lies across the river, in Cambridge, which, though it reflects the spirit of Boston, is a separate municipality.

ends" is an old mill saying. A pound of finest Australian wool can be spun out to 22 miles! From such yarn come the finest serges, dress goods, and broadcloth.

Short fibers, combed out in making the ropes or tops, are called "noils." They are blended with longer wool to make woolens and felts. That woolly fuzz in your overcoat pocket is noils, wearing away.

Felt, says a tradition in the woolen mills, got its name from an old French monk who once made a long pilgrimage. When his feet became sore, he clipped some wool from roadside sheep and put it in his sandals. Lo! a miracle! The bits of wool had become one solid mass. He had made felt, just as it is made to this day—that is, by heat, moisture, and pressure.

For blocks along Summer Street you smell wool and pass nothing but wool traders. "This wool colony should have

a mascot," I urged, "a lamb to gambol about your desks or follow you around the golf courses."

"Look," said a broker, "I have!" But his was stuffed and set in a glass case; and over the entrance to his office was a ram's head carved in stone.

Americans with ancestral lines lost in genealogical mists come to Boston for help; here they may learn, too, whether they have the right to assume a coat of arms.

Copying epitaphs from old tombstones, searching family Bibles, church, government, and other records for facts on marriages, births, military service, deaths, wills, etc., is a brisk local enterprise, employing many trained genealogists. One such advertises that he has "11,000 gravestone inscriptions from Middlesex County." Others announce "Lineage papers for patriotic societies prepared."

BOSTON'S FINEST PRODUCT: TRAINED MEN AND WOMEN

"Desire to join such societies as the Colonial Dames, Sons of the Revolution, and the D. A. R.," said one genealogist, "of course results in many clients for us."

In Wall Street, in Minneapolis flour mills, on Arizona cow ranches, in schools and libraries of the Northwest, you find men and women trained at Harvard, Boston Tech, Boston University, Simmons, Radcliffe, Wellesley, and the New England Conservatory of Music, as well as many other near-by seats of learning. All make New England peculiarly a national source of culture, with wide-spread effect on manners, ethics, and character.

To a degree seldom appreciated, these graduates, scattered over the Union, tend to reduce sectionalism and promote understanding among the States.

Twitting Boston on its book learning is an idle all-American weakness.

As so often sketched by newspaper artists, the Boston small boy is a spindle-shanked lad of intellectual mien and oversized owlish spectacles.

There is Sousa's quip that he never could understand the Einstein theory until a Boston policeman explained it to him. And that anecdote of two Beacon Hill hackmen who blocked traffic while they argued whether the influence of Ibsen was permanent or evanescent!

To such flippancy Boston is indifferent; she may have other ideas of what is funny. Anyway, busy for 300 years with her own thoughts, Boston (as the traditional "state of mind") is preëminently the philosopher among American cities.

Puritans founded America's first free public school here, in 1635; it survives, as the Public Latin School. The next year, at Newtowne, now Cambridge, across the Charles River from Boston, Harvard College was born. Here American higher education began.

Today Boston's metropolitan area includes more than 200 universities, colleges, normal, technical, music, art, and private schools of various kinds, besides the public schools.

Finding "something to read" is easy; 156 different libraries are available to the public, in addition to college, university, and special libraries.

The Athenaeum, owned by its members, is known as the world's first gentleman's library; it is the world's largest library whose shelves are all open to readers, and among its treasures is the biography of an English outlaw, bound in his own skin!

The Public Library at Copley Square, famous for its Abbey paintings of "The Holy Grail," has 34 branches. From it more than 5,000,000 books circulate each year; whole armies crowd the public reading rooms, while yet another army busily writes and prints the city's 128 daily and other papers, in many sizes and languages.

With such adventures in culture come also the museums: that great palace, the Museum of Fine Arts; the spectacular Isabella Stewart Gardner Museum; the Fogg Art Museum at Harvard—these and others.

For those having eyes it is futile to *write* about museums. How useless, for example, merely to catalogue the Japanese exhibit at the Museum of Fine Arts! Or how futile to write words about that simple spray of blooming mountain laurel made of glass, in Harvard Museum!

Since time began, no art has rivaled these miraculous glass flowers of Blaschka, the German. Look at his unique, so-different form of artistic achievement, and you agree that art is never a finished product; that, to its creator, it is an activity always progressing.

Yet buildings in which museums are housed, like other public edifices in Boston, reflect the architecture of other times and places. Only the astonishing forms of such structures as the United Shoe



Photograph by B. Anthony Stewart

"SNOW TRAINS" TAKE WINTER SPORTS FANS FROM BOSTON TO THE WHITE MOUNTAINS

With skis, skates, and sleds, week-end crowds leave at the first news of heavy snows. Some start early Sunday morning for such places as North Conway and Intervale, the train being sidetracked while college boys, schoolgirls, and others enjoy the fun. Ski enthusiasts even come from New York to join these excursions. More than 24,000 people rode the Boston and Maine Railroad's "Snow Trains" from January 1 to March 8, 1936.



Photograph by Luis Marden

"... AS I WAS SAYING, WHEN SO RUDELY INTERRUPTED ..."

Self-anointed Ciceros on Boston Common tackle any theme from the Single Tax to Infant Baptism. Speech is free, and so are listeners—free to laugh, heckle, and contradict (page 57).

Machinery building reveal American conceptions; they recall a German saying that our finest architectural feat is seen in western grain elevators.

NOBODY ASKED, "HOW DO YOU LIKE BOSTON?"

Boston's career as an American city began on that exciting day in March, 1776, when General Howe evacuated with his British troops and sailed for Halifax. When General Washington entered next day, all he could find for lunch was a piece of salted beef!

Life was strict and simple. Governor John Hancock himself once paid a fine for taking a buggy ride on Sunday. Men and boys were punished for swimming on Sunday. In the Centinel a wag wrote:

> "In superstition's days, 'tis said,
> Hens laid two eggs on Monday,
> Because a hen would lose her head
> That laid an egg on Sunday.
>
> Now our wise rulers and the law
> Say none shall wash on Sunday;
> So Boston folks must dirty go,
> And wash them twice on Monday."

"Stage plays" were illegal. Drama lovers, circumventing this, advertised plays as "moral lectures," and once staged "Macbeth" as "A Dialogue on the Horrid Crime of Murder."

To smoke on the street was a penal offense until 1880, although a "smokers' circle" was set aside on the Common.

All that was long ago. Time's changes in the city's physical and racial structure have of course brought corresponding changes in customs, behavior, and thought. Stubbornly, however, the spirit of the Anglo-Saxon founders still survives. Like its old families, Boston itself is simple, dignified, reserved.

"How do you like Boston?"

During a long visit nobody asks you that. Simple hospitality, effective aid in your quest for facts, these you do meet; also, a caution that leans to understatement rather than guesses, and never to exaggeration. Yet opinion, after evidence is all in, is your own responsibility; no one seeks to influence that. Should you err, Boston will not be disturbed. Age has mellowed her, and eventful history records the true story of those achievements which make her, to one born in the Middle West, America's most interesting city.

HOW WARWICK WAS PHOTOGRAPHED IN COLOR

By Maynard Owen Williams

PERHAPS the finest view of Warwick is free to all who pass. Across the Avon, not far above an earlier structure dominated by the towering walls, is the "new" bridge, only 146 years old. And from it, seen between and above the trees which overhang Shakespeare's river, there is a breath-taking view of the wide walls and tall towers of Warwick.

But who, seeing such a sight and knowing that visitors are privileged to roam the halls which kings and queens have trod since the days of Elizabeth, could resist the appeal of this fortress, armory, treasure house, art gallery, and home? So, with hushed expectancy, we walked through a rock corridor and approached old Warwick's inner gate.

Shrubs and trees mask the hardness of this hundred-yard defile, easier to defend than Thermopylæ. There is no mistaking the fact that here one must come as a friend or not at all.

Farther on, the view widens to broad flower beds and lawns, but an enemy would —and many did—find this an inhospitable spot. Two tall towers dominate the scene and in them are loopholes so cunningly planned that a bowman had but to sight down one to hit a foe in the gallery below. A loophole like that was almost like a gun barrel, trained on an enemy who could not but face its muzzle.

From Caesar's Tower, the defenders had an added advantage (Color Plate I). The solid rock on which it stands slopes outward at such an angle that no knight, even with ground-gripping spikes on his armored shoes, could scale its surface. But a stone dropped from the parapet some forty yards above could carom off the rock base at right angles and plow through half a dozen of the attacking force, putting unwonted creases in armored pants and flattening out pouter-pigeon breastplates.

Guy's Tower, built a century before Columbus discovered America, recalls the tales of the redoubtable Guy of Warwick.

"Some Guy!" an American exclaimed on being shown the hero's huge "punch bowl." It holds 120 gallons and was really the cooking-pot for the garrison. Today vines with bright berries warm the old rock of the tower, which still has the fine finish of honest workmanship (Plate VI).

A stone arch has supplanted the old-time drawbridge, but few would care to storm the barbican, for behind the portcullis (Plate III) there are holes from which melted lead or blazing tar could be poured on the heads of would-be invaders. Disconcerting it must have been to have one's best suit of armor turned to a roasting pan in the twinkling of an eye and the twist of a foeman's wrist high up on the castle walls!

HIS HOME IS HIS CASTLE

Inside the gateway, this martial castle becomes a peaceful country home, residence of the present Earl of Warwick. A sleek sports roadster stands before the door at which knights in armor once dismounted to clanging sounds like the Anvil Chorus. Within the frowning walls stretches a smiling courtyard, turfed with the smooth sod of Old England.

Once past the heavy palace door one plunges deep into time. Armor gleams on the walls of hall and passageway. Old masters, sweeping aside the present, introduce the days of white bosoms above voluminous trains, and of ruffs and laces worn by men with long hair—and a way with a sword.

In such a setting, one's everyday companions seem strange. A girl in shorts seemed like a visitor from Mars. Entering the chapel and standing before Perugino's painting of the Assumption, she covered her head with a scarf, giving her bobbed-haired modernity a touch of the Old World, and achieving poignant dignity.

Our host had a genius for conjuring up a living past amid Warwick's lasting relics. As he talked, imagination peopled the great hall and grounds with a noble company reaching back to the days of Alfred the Great. It was Alfred's heroic daughter, Ethelfleda, who built the early fortifications here to protect mid-England from the Danes.

It is useless to describe the treasures of Warwick. Here a picture is better than thousands of words (Color Plates IV, V, and VIII). In the state bedroom hang Brussels tapestries woven before the Jamestown colony was founded. Since they were made the

known world has tripled or quadrupled in extent, then has shrunk again before the marvels of modern communication. Yet those old tapestries keep their beauty and fit those walls far better than modern hangings could.

THE CASTLE IS SURRENDERED

Later, with the estate manager, I discussed plans for my pictures.

Once my identity was known the cooperation was whole-hearted, for three Countesses of Warwick are fellow members of the National Geographic Society. At 4 o'clock on Monday afternoon the last party of visitors would leave those stately halls. At 4:15 Warwick Castle would be mine.

As long as I cared to work that night, an electrician and helpers were to be at my disposal. Old silks and time-browned canvas, Florentine mosaic and waxen Venus, shining armor and canopied bed—all mine, for the National Geographic Magazine.

But photographing paintings in color is a studio job. A castle with small windows, dark decorations, and walls ten feet thick is not the place. Yet here I must capture with the color camera those tones which brought glory to Rubens and Van Dyck, Holbein the younger, and Sir Joshua Reynolds. The equestrian Charles occupies an entire end of the great dining room and towers almost to the lofty ceiling (Plate VIII). Enormous problems of lighting loomed.

All this I explained to the Earl of Warwick, whose kindness approached 100 percent. The castle would be ready. I could have all the 100-volt current the former flour mill turned by the Avon could generate. If I wanted to tap the Leamington power line, of 220 volts, that would be arranged.

But much equipment and assistance remained to be gathered. And only a Sunday lay between me and the responsibility of having a castle on my hands. Back to London I went by train.

There a few minutes on the telephone convinced me that my worries might as well be postponed till Monday morning. Londoners have the enviable habit of escape over the week-end.

But Monday was fruitful from the first. The friend who has advised me about cameras for years was all helpfulness. So was the world-famous concern that makes my films. Packages of material began to accumulate in several places at once, with not a scrap of red tape in sight.

A friend with whom I had roamed the wind-swept slopes of the Scilly Islands had promised aid.

"I have just the man for you," she greeted me. "He has his lamps—all 100-volt, which is what you want—packed in his car, ready to start. You'll never do it with flashlights even if you shoot a hundred of them, and little lamps will spread white spots like leprosy over every painting you photograph."

Since this friend of a friend had everything we would need, I telephoned orders to have innumerable bulbs, reflectors, and tripods returned to stock, then dashed for the train. It had left.

One small traffic jam in London—which sadly prophesies that it will be at a standstill in another decade—had done it. But the guard whisked me onto another.

"Change at Oxford," he said, and his voice was positively cheerful, as if changing trains were a privilege.

CAMERAS AMID GHOSTS IN ARMOR

Back in Warwick, things moved fast. The taxi which I had sent to bring my "technical assistant" arrived at the same time as my tea. Lunch had been out of the question and leaving that piping hot tea untasted smacked of heroism, I felt.

"I have to catch the 11:36 back to town," said my friend, thus spiking any plan I had for an all-night ghost party of lights and shadows amid the knights in armor in Warwick's great hall.

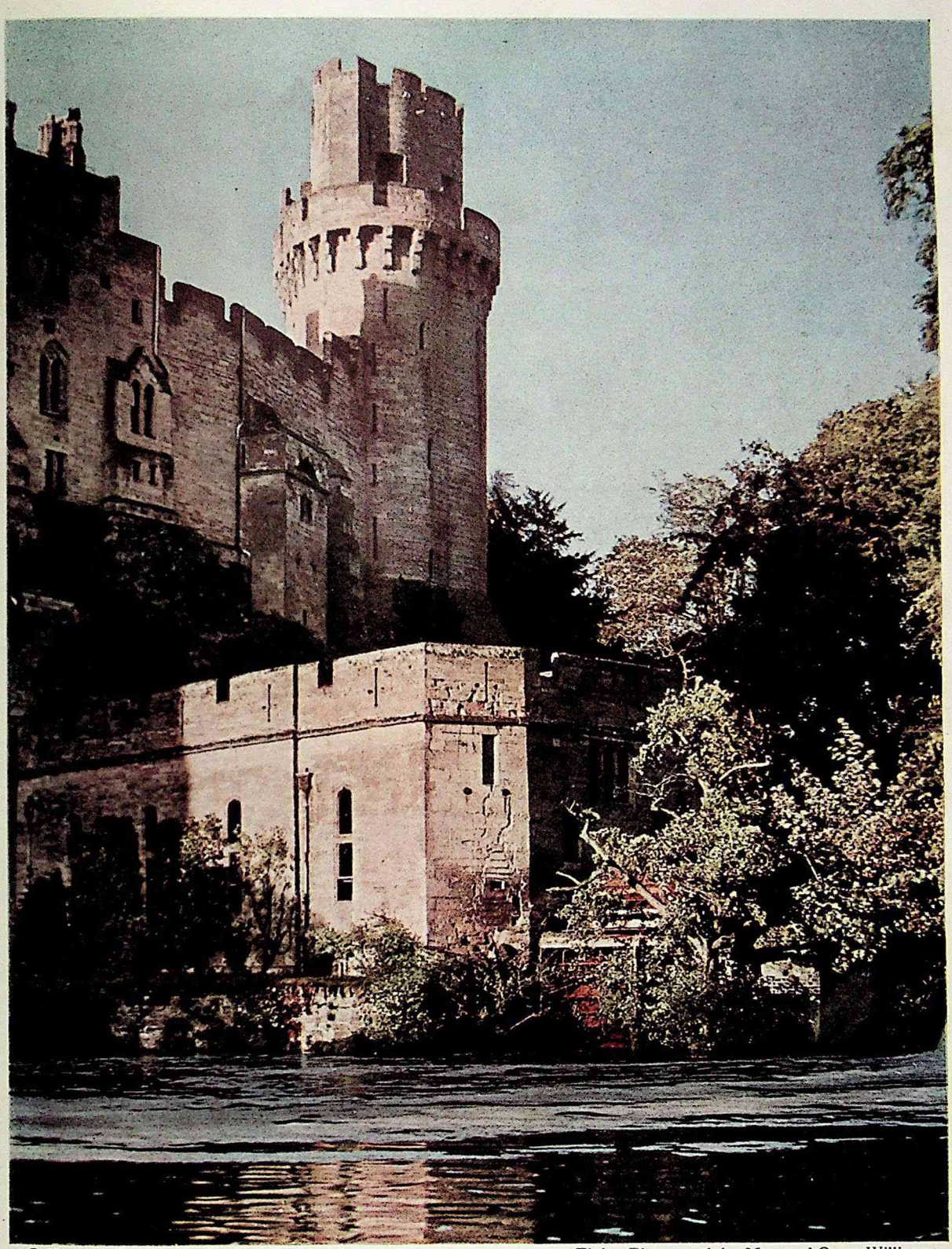
The portcullis would be left up, the gateman on duty. We plunged to work, but it was three hours before we completed the first exposure.

There in the night-dark castle we seemed strange anachronisms. Across the mirror-smooth floors our light cables squirmed like serpents. The ghosts of centuries retreated from the glare of our lamps, only to slink into corners behind us and watch us work.

Some of the paintings I had chosen were high on the walls. But a portrait must be photographed from a point opposite its center. Henry VIII, taken from too low down, becomes all stomach and no head.

In the color process I used, wide-angle lenses will not do because light jumps from a red square to a yellow one, putting jaundice on a nose which some monarch was at great pains to color with good red wine.

WARWICK CASTLE, STAGE FOR OLD ENGLAND'S PAGEANTRY



© National Geographic Society

Finlay Photograph by Maynard Owen Williams

"FAIREST MONUMENT OF ANCIENT AND CHIVALROUS SPLENDOUR,"
SIR WALTER SCOTT CALLED WARWICK CASTLE

English peers for nearly six centuries have dwelt in this feudal stronghold on the Avon, about eight miles from Shakespeare's Stratford. Caesar's Tower, with narrow loopholes for bowmen, commanded the river. Missiles dropped onto the sloping base bounced on heads of attackers, who were also deluged with blazing pitch and molten lead from the turret. The water wheel once operated a mill; now it turns a generator supplying the castle's electricity.



CHEERY VINE-CLAD COTTAGES HOUSE THE EARL OF WARWICK'S RETAINERS

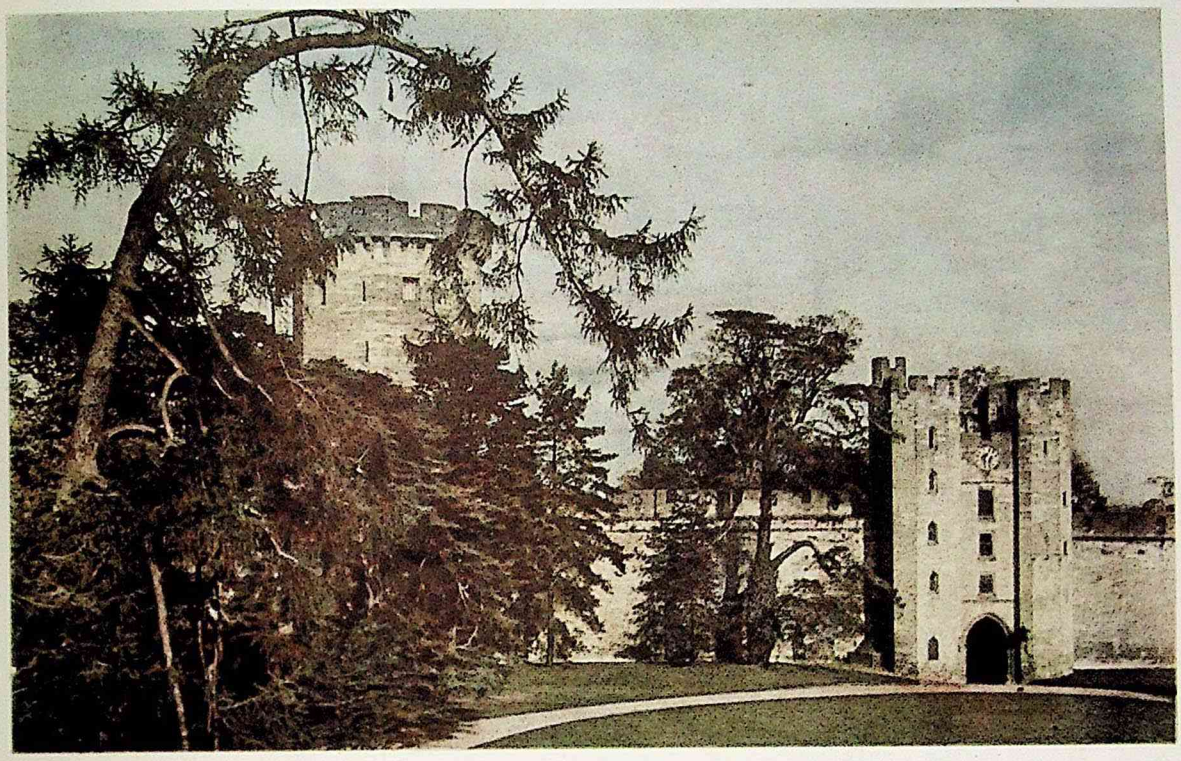
The backyard gardens of these homes front on the Avon across from the castle and the ancient town of Warwick. Quiet villages, old manor houses, shady lanes, and meadows characterize the Midland county of Warwickshire, once called "the core and center of the English world."



© National Geographic Society Finlay Photographs by Maynard Owen Williams

LARGE DORMERED DWELLINGS ARE FOR OFFICIALS OF THE ESTATE

The present Earl's staff is modest compared with that of a 15th-century predecessor, Warwick the "Kingmaker," whose horde of retainers consumed six oxen at breakfast.



ENGLAND'S GREAT HAVE PASSED THROUGH THE NARROW PORTAL TO THIS INNER COURT

During Queen Elizabeth's visit, country people came "to see the dance in the Court of the Castle, Her Majesty beholding them out of her chamber-window." The mansion is to the right of the gate, whose portcullis dropped behind The Society's photographer when he left late at night.



© National Geographic Society Finlay Photographs by Maynard Owen Williams

PEACOCKS ROAM THE GARDENS, WHERE CLIPPED HEDGES ASSUME ODD SHAPES

The castle is occupied by the Earl's family, but parts of it are open to visitors. It is "a national glory as well as a personal possession," wrote the Countess of Warwick.



© National Geographic Society

"FINE PORTRAITS ARE WHAT I PARTICULARLY DESIRE"

Thus wrote George Greville, Earl of Warwick, in 1779. Rubens' picture of St. Ignatius of Loyola is in the green drawing room.



Finlay Photographs by Maynard Owen Williams

HENRY VIII, BY HOLBEIN, HANGS IN THE CASTLE BOUDOIR

The much-married monarch is portrayed in jewels, ermines, and lace cuffs by his court painter, one of the old masters.



© National Geographic Society

A DIFFERENT HENRY VIII IS THIS WIDE-EYED BOY, PAINTED LONG AFTER THE KING'S DEATH

Sir Anthony Van Dyck and his assistants imagined Henry as he might have looked before acquiring gross features and vast girth. In photographing this and other "old masters" at Warwick Castle, The Society's photographer utilized electric light generated by the old grain mill on the Avon (Plate I).



Finlay Photographs by Maynard Owen Williams

NOBLE BROTHERS POSE IN PINK SATIN AND LACE FOR A PORTRAIT BY VAN DYCK

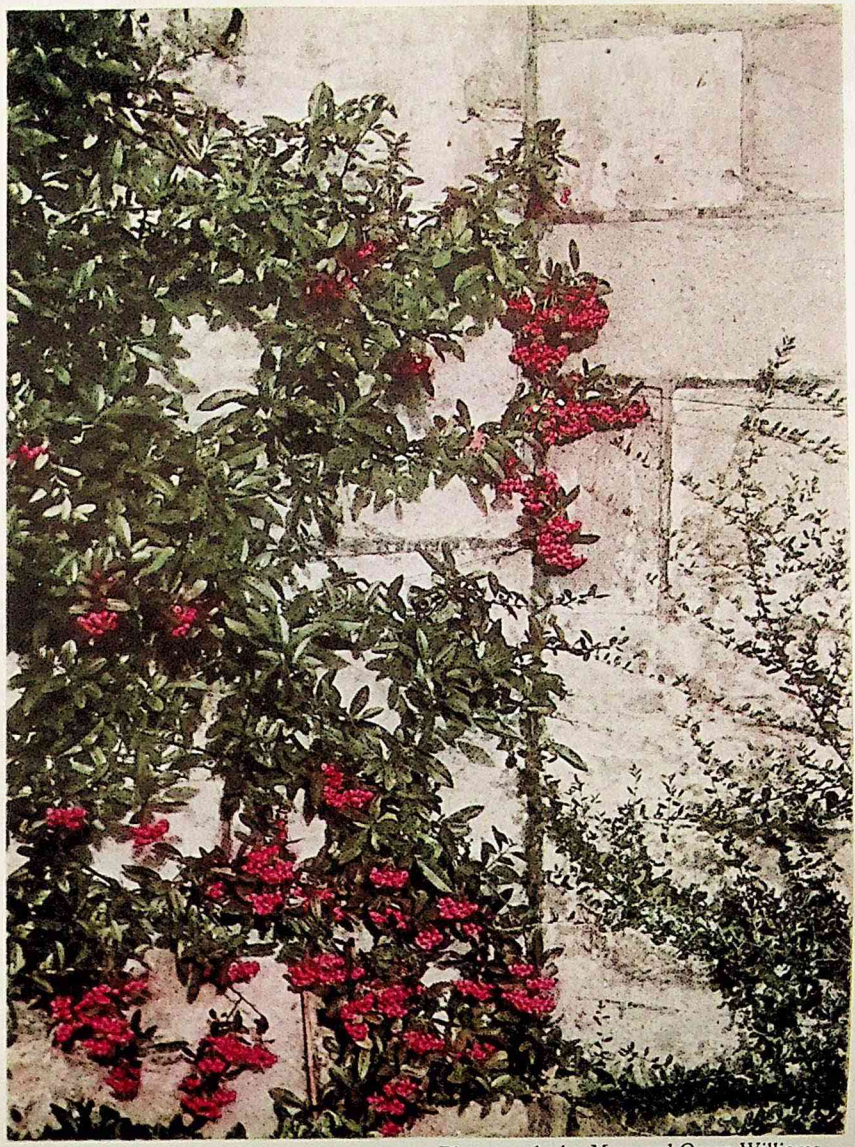
George, Duke of Buckingham, left, and Lord Francis Villiers were brought up with the children of unlucky King Charles I. The younger brother was killed in his teens during England's Great Rebellion, but the Duke lived to be a statesman, poet, dramatist, and popular leader of fashion in Charles II's reign.



© National Geographic Society

TIME HAS DEALT KINDLY WITH WARWICK

Few other medieval fortresses have survived with so little outward change as this castle. The boy Shakespeare probably gazed across the Avon towards such parapets and mullioned windows.



Photographs by Maynard Owen Williams

BRIGHT BERRIES BEDECK A GRIM WALL, TEN FEET THICK

The vine clings near the base of Guy's Tower. *Ethelfleda, daughter of Alfred the Great, built a wooden fort at Warwick about 1,000 years ago as defense against Danish invaders.*



© National Geographic Society

Finlay Photograph by Maynard Owen Williams

HERE KINGS AND BARONS PLAYED STAR ROLES IN ENGLISH HISTORY

The scene from this meadow across the Avon was not always so peaceful. William the Conqueror used a former Warwick fortress as headquarters during his campaign in England. Here Warwick the "Kingmaker" imprisoned Edward IV, whom he later deposed. Caesar's Tower, right, believed to be the oldest part of the castle, is 147 feet high and is based on solid rock, preventing underground attack.



© National Geographic Society

Finlay Photograph by Maynard Owen Williams

IN THE GREAT DINING ROOM IS VAN DYCK'S EQUESTRIAN PORTRAIT OF CHARLES I

It seems strange to find this picture in Warwick Castle, for the fortress became an anti-Royalist stronghold when its owner joined the Parliamentary forces against the hapless King. Here Charles wears the light armor and broad lace collar of his time, while an equerry bears the royal helmet. Dr. Williams relates how he took this color plate of the huge painting: "To get our cameras high enough, we had to construct on the state dining table a pyramid of stools, sawhorses, and tripods worthy of a circus balancing act."

The distance of my camera was fixed and it seemed as if, in every spot where I had to set my tripod, there was a priceless mosaic table, brought from far-away Italy in the days of crude transport and since preserved through blood and fire for centuries.

I felt like some rank intruder from a world that is yet to be amid the proud treasures of the past.

Some of Warwick's finest paintings were away on loan during my visit, but there were enough left to have kept me busy for weeks.

The picture of the two sons of George Villiers, Duke of Buckingham, appealed to me because it was from Warwick that scheming Richard III wrote to the Governor of the Tower of London ordering the death of his two small nephews, sons of Edward IV. These boys in their innocence and splendor of garb made me think of the "little princes of the Tower," and, besides, this painting by Van Dyck had a challenging range of colors (Plate V).

In the boudoir at the far end of the state apartments I selected two paintings of Henry VIII—Van Dyck's, showing him as a half-timid child, and Holbein's, which pictures bluff King Hal as every inch a king, albeit a king with whom the gentle George V, who called himself "a very ordinary fellow," would have had little in common (Color Plates IV and V).

While my camera was at work making the long exposures, I tiptoed back and forth, conferring with the ever-helpful electrician as to where we could plug in the lights for the next picture, or trying to restore some order to the chaos our work had caused.

The painting of Ignatius of Loyola is outstanding, even in so rich a collection as that at Warwick. Rubens here combines the rich trappings of ecclesiastical dignity with the spirituality of the man. The founder of the Order of Jesuits stands before us in a portrait notable for its force and rich coloring (Plate IV).

PHOTOGRAPHERS TURN ACROBATS

After a late snack with the seventh Earl of Warwick, we tackled the painting which taxed our knowledge and equipment most—the huge equestrian portrait of Charles I (Plate VIII). Providing the canvas for pictures of such heroic size must have influenced the textile statistics of Van Dyck's day.

To get the camera high enough, we had to construct on the state dining table a pyramid of stools, sawhorses, and tripods worthy of a circus balancing act. Then, as we focused the camera, our heads brushed the highly destructible chandelier—hundreds of pounds of it. "Heavy, heavy hangs over thy head," was its recurrent warning. Nor, try as we would, could we get our floodlights in such a position that a glare in some part of the painting would not kill the color.

If you look closely at the sides of that great painting you will see how the electric light generated from Warwick's old grain mill, still turned by the quiet Avon, has put a sheen over the coloring.

At eleven o'clock the shutter closed on the last exposure, and we hurriedly collected our equipment from its hiding places under furniture gathered from half of Europe or from the feet of lordly forms created by Flemish or English artists.

Down corridors bristling with armament we carried our bulky reflectors and cameras. While a knight on horseback looked on dispassionately, my companion wondered when his taxi would arrive.

We had ordered the car for 11:15. And as we slammed the automobile door after our anachronistic labors, it was just that. Even the portcullis might have been worked by a time clock, for, as we left the hospitable castle behind, the grating dropped, as if closing the adventure forever.

I had still to make color views of Warwick's exterior, and of the gardens where peacocks strut (Plate III). But that, in the sunshine, would be comparatively easy.

That night, after seeing my friend off on the train, I returned to my hotel, empty of stomach and light of heart. It was midnight and the ten bells of Warwick's St. Mary's softly began a new tune. Just before we had taken the castle by storm, the chimes had been playing "Home, Sweet Home." Now they started a new day with "Jenny Lind."

When next St. Mary's bells played "Home, Sweet Home," I was *there*. For better or for worse I had accepted Warwick's challenge and my plates came home in my own hands, keeping their secret of success or failure till the National Geographic Society laboratories were reached.

Here they are, the result of a noble hospitality which still warms my heart.



A CROWD ON THE BRIDGE AT SALMON WATCHES THE START OF "THE WILDEST BOAT RIDE IN AMERICA"

Because of unusually low water all the party except the boatmen and cook disembarked below the new highway span and rejoined the scow at Ebenezer Bar, 56 miles farther downstream. The boat carried the scientists who were to investigate some of the most remarkable geologic formations in North America.



STEELHEAD FISHING WAS GOOD

The *National Geographic Society* waited here at Middle Fork while Shenon, Reed, and Williams made a side trip up the rugged stream. This junction of the Salmon River and its Middle Fork is a favorite center for fishermen and hunters.

DOWN IDAHO'S RIVER OF NO RETURN

By Philip J. Shenon and John C. Reed

Leaders of the National Geographic Society–U. S. Geological Survey Salmon River Expedition

With Illustrations from Photographs by Maynard Owen Williams

IN 1803 President Jefferson gave his blessing to an expedition led by Lewis and Clark, whose achievement is history. The leaders of the Nation's first overland expedition to the Pacific turned back only once—when they faced the precipitous walls and "white waters" of the Salmon River Canyon.

Thus the Salmon remained unconquered until about 40 years ago, when Captain Harry Guleke piloted a flat-bottomed scow through its thundering rapids to its mouth (page 98).

HOW GULEKE CONQUERED THE SALMON

Like Phoenician mariners, using islands as stepping stones to far-away shores, Guleke and Sanderland, his first mate, braved one rapid after another, learning the secrets of each before venturing farther into the unknown.

Boats were smashed on hidden rocks, and lives were lost, but one-way traffic on the Salmon had come to stay. The trip is still known as "the wildest boat ride in America."

Unlike Guleke, we, as geologists working in the high mountain country above the river for the United States Geological Survey, were challenged not by the rapids but by problems of scientific and economic interest, solution of which appeared to lie partly in the canyon that yawned below us.

How did the granite mass known as the Idaho Batholith invade the rocks surrounding it? (Page 105.) How far did the veins exposed on the plateau above extend into the canyon? Why did the Salmon River cut directly across the grain of the rocks, and why did some tributary streams flow scores of miles to pass again within four or five miles of their sources?

The National Geographic Society saw the value of an expedition through the canyon and sponsored our plans. Dr. Maynard Owen Williams, photographer and writer, of the National Geographic Magazine staff, was sent with the expedition.

Mr. Howard R. Flint, Regional Forest Inspector of the United States Forest Service, was assigned by that organization to study the plants and animals.

Dean A. W. Fahrenwald, metallurgist and educator, accompanied the expedition in his capacity as Director of the Idaho Bureau of Mines and Geology.

U. S. Representative D. Worth Clark, of Idaho, an enthusiast for the trip since it was first proposed, was made a member of the expedition because of his interest in the primitive areas of his native State.

The Salmon River rises amid rugged peaks of the Sawtooth Range, over 10,000 feet high. From this spectacular beginning the river flows through valley and canyon to its confluence with the Snake near where Oregon, Washington, and Idaho meet (map, page 105). In 390 miles it falls more than a vertical mile.

The Salmon River Canyon is one of the deepest and most rugged in North America. From rim to river its depth in several places exceeds 6,000 feet. This is more than that of the equally wide Grand Canyon of the Colorado, about 5,500 feet deep near Bright Angel Canyon, but less than that of the Snake River Canyon, which not far from He Devil peak is 7,900 feet deep.

MANY MET DEATH FROM "LEAD POISONING"

Except for occasional Indians, man played little part in the early history of the country. In 1861 gold was discovered near the canyon brink. Waves of prospectors from California and Oregon swept eastward, meeting a westward-advancing army from the Atlantic. Road agents and gamblers rubbed shoulders with miners and merchants. Before vigilante committees curbed crime, many met sudden death by "lead poisoning."

From mushroom mining camps at Florence, Elk City, Warren, Dixie, Leesburg, and Grantsville (now part of Leesburg) millions poured into the war-depleted treasury of President Lincoln.

Rich pockets sometimes yielded a hundred dollars to a shovelful. When the richest ground was skimmed, the impatient miners departed, leaving the "diggins" to Chinese, who flocked to the placers after helping to complete the Central Pacific Railroad (page 122).



FORESTS OF PAST AGES ARE BURIED IN THESE SHALE BEDS

An outcrop of the Latah formation along the North-South Highway near White Bird makes a "happy hunting ground" for paleobotanists. Fossil plants of many species are abundant here where the authors are prospecting for them.

In 1877, under the able leadership of Chief Joseph, the Nez Percé Indians went on the warpath, and participated in one of the most remarkable running fights on record. In 1878 the Bannock Indians killed a number of white settlers. In 1879 a group of renegade Sheepeater (Tukuarika) Indians, after fighting several hard battles in the upper Salmon River country, were finally captured.

So ended Idaho's Indian wars.

Civilization again pushed forward in a more or less circumspect manner. Occasionally the new citizen miner would hear the call of gold and rush off to some "big strike," but usually returned with little more than hands in his pockets. In 1898-9 rich gold lodes were discovered at Buffalo Hump and Thunder Mountain. Hundreds flocked to new diggings that soon petered out. A landslide wiped out Roosevelt, the only town at Thunder Mountain (p. 119). The panic of 1907 finished Buffalo Hump.

THE UNEMPLOYED TURN TO MINING

Now, along with other early-day camps, both districts are awakening because of better transportation and dearer gold. The Forest Service and C.C.C. are constructing much needed roads. The unemployed have turned to gold pan and rocker.

To our wild boat ride we added side trips to spots where history is repeating itself. First, with Allen Merritt, of Salmon,



Photograph by Washington National Guard

SOLDIER BAR LANDING FIELD TYPIFIES THE DIFFICULTIES AND DANGERS OF FLYING IN CENTRAL IDAHO

Perched on a small terrace in Big Creek Canyon, this Forest Service aviation base (the light spot lower right) derives its name from the fact that a soldier killed in the Sheepeater Indian War was buried in its soil. The small field is used principally to unload men and equipment to battle forest fires in the isolated region around it.

we went by car to Redfish Lake, a source of the Salmon River.

We skimmed smoothly over new gravel roads, now past bluffs cut in sediments accumulated when the entire valley was a lake bed, now along the river's edge through ancient lava flows, or slates deposited as clay millions of years ago.

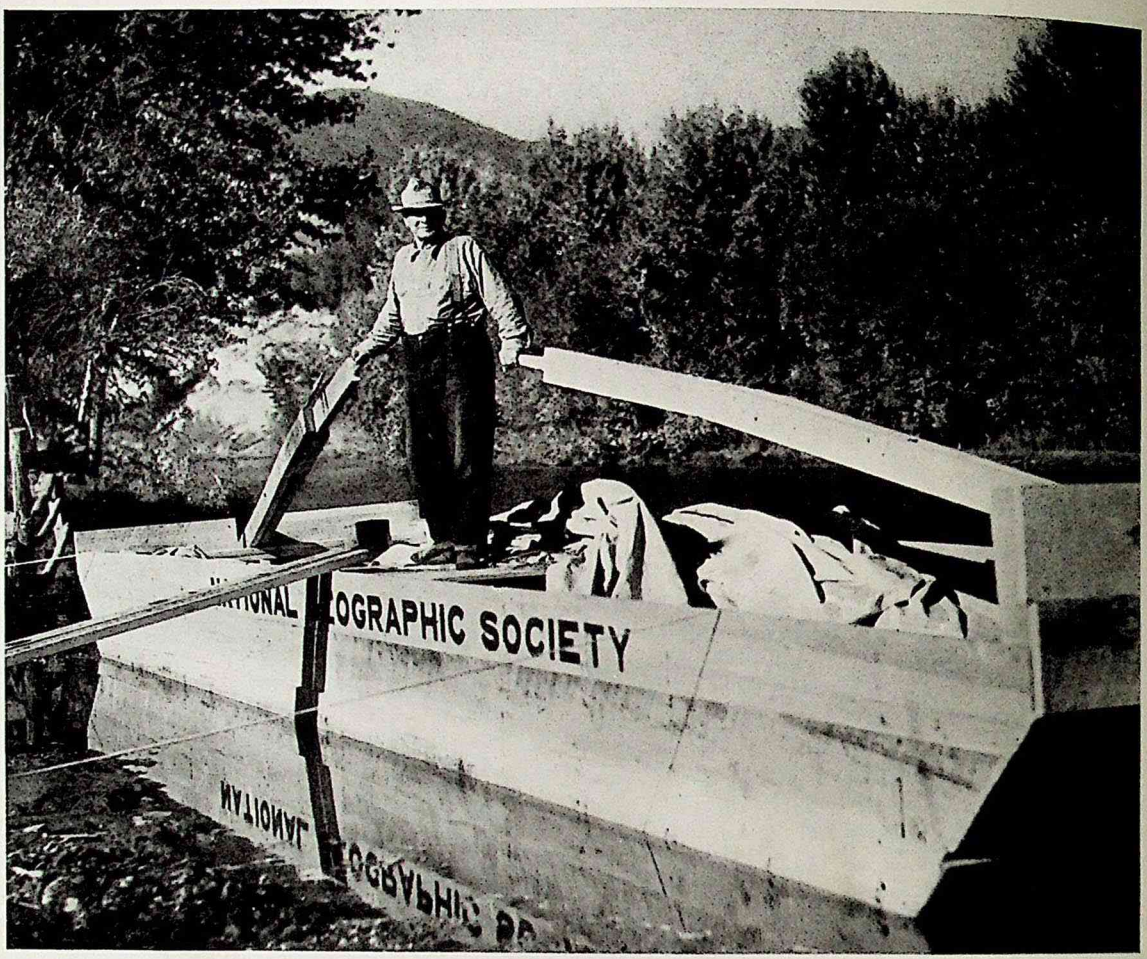
We passed small farms along the river and honked through flocks of sheep on their way to winter pasture.

As we rounded a curve near the Pahsimeroi River, which heads near Borah Peak, 12,655 feet high, we came upon a band of half-wild horses herded by two cowboys. The Pahsimeroi Valley has produced some of the finest cattle and rough-riding cowboys in the United States.

Amid white-faced cattle we rolled into the flat country which centers around the little town of Challis. Here we met Pete Grubb, a champion rodeo rider.

After 24 miles of crooked, bumpy road our route melted into a wide highway. Steam shovels were even then at work and we paused to watch the giant machines gulp great mouthfuls of broken rock.

Beyond canyon country painted with splotches of yellow and gold by an early frost we came to Stanley and Redfish



THE MASTER CRAFTSMAN SURVEYS HIS BRAIN CHILD

A veteran riverman, Captain Harry Guleke, the first man to navigate successfully the Salmon River Canyon, fondles the sweeps of the Expedition's scow built from his own design (pages 95 and 99). Forty years ago, before anyone else had dared to make the passage, Guleke worked his way through the gorge, first learning the secrets of one rapid before attempting the next.

Lake. A Basque sheepherder and his flock lent a pastoral touch to the evening scene at the lake.

Back at Salmon we wasted little time in seeking our beds—for tomorrow we expected a Washington National Guard plane from Spokane for aerial photography above the canyon.

At the landing field, provided by Salmon's flying mayor, Flint warmly greeted Observer E. C. French and his old friend and flying companion, Pilot Clare Hartnett. These men, at Flint's request, and in recognition of the National Geographic Society, generously flew 2,000 miles over dangerous mountain country to take the aerial photographs used in this article.

With an afternoon storm already clouding the scene to the west, the plane, refueled, soared gracefully back in the direction whence it had come, while we returned to the river.

A BOAT FOR AN EXTRAORDINARY VOYAGE

Our 32-foot boat was almost complete. The 28-foot sweeps, with their 6-foot blades, were in place and by tomorrow it would be ready to "sail." What a strange craft it was! To Williams it looked like an antediluvian ark sired by some prehistoric mail-order packing case.

An elevated platform in the center gave the boatmen foothold and a better view while steering. The bottom of this deceivingly maneuverable scow was doubly lined with green lumber to withstand the shock of submerged rocks. A raised floor was to keep the seepage water from wetting the equipment. Between double walls on each side were stored our canned goods.

The boat, of a model unchanged since Guleke invented it, weighed about five tons when loaded. Without motive power, it looked clumsy. We were to learn later, however, that Hancock and Cunningham, with sweeps balanced like laboratory scales, could manipulate with surprising dexterity the best-known and most-photographed scow that ever bumped its uneven way down Salmon River.

About 10 a. m. on October 4 Captain Guleke grasped the front sweep, and our scow, empty because of low water, left its birthplace, never to return (pages 94, 109).

Although the old riverman has probably taken his last boat through the canyon the light of adventure still shone brightly in his eyes as he steered our craft the first few hundred yards down the river he conquered but could not tame.

After floating under Salmon's new bridge, we disembarked to put in our time in side trips while the barge descended toward deeper water for cargo and passengers.

To inspect the rugged uplands we motored to the Big Horn Crags country, where Supervisor John Kinney, of the Salmon National Forest, had arranged for Ranger Gutzman to meet us with horses.

In the sixties the gold of Napias Creek attracted 7,000 adventurers, many of them Civil War veterans, and rival factions built up almost overnight the towns of Leesburg and Grantsville. At Forney we turned west over Quartzite Mountain to our rendezvous.

WHEN THE CANYON WAS "IMPASSABLE"

For eight miles we rode our horses deeper and deeper into the crag country. What peculiar yet beautiful freaks of weathering they were, rearing their pock-marked faces spirelike to the sky! Reluctantly we turned back, creakingly crawled into our car, and drove into Salmon under a star-covered sky, tired and stiff.

We set out on Sunday morning to rejoin our scow at Ebenezer Bar.

After 10 miles of wide, cultivated valley the canyon narrows, and at 23 miles below Salmon we noted a decided "pinching in" of the walls. Near this place Toby, an Indian guide of the Lewis and Clark expedition, had convinced Captain Clark that the Salmon River Canyon was impassable, and here the party had turned north to seek a less forbidding "gateway" to the Pacific by way of the Lolo Pass.

We followed the river to Shoup, named in honor of Idaho's first State Governor and United States Senator. It is a strange-looking old place with building lots standing on end, a town where for several years freight and supplies have been transferred from truck to horse. Although Shoup is now booming and new roads simplify transportation, the pack train will not soon end its usefulness in this rugged region.

Near the mouth of Panther Creek we inspected Indian paintings on the rocks, and piles of mussel shells left at an old camp site. Later we were to see many such paintings, as well as numerous petroglyphs (figures cut into rocks), in both the Salmon and Snake River Canyons (page 121).

Indians today have no knowledge of the origin or interpretation of these figures. However, since many portray the mountain sheep, the symbol of the Tukuarika, or Sheepeaters, it seems likely that this tribe was responsible for part of the inscriptions.

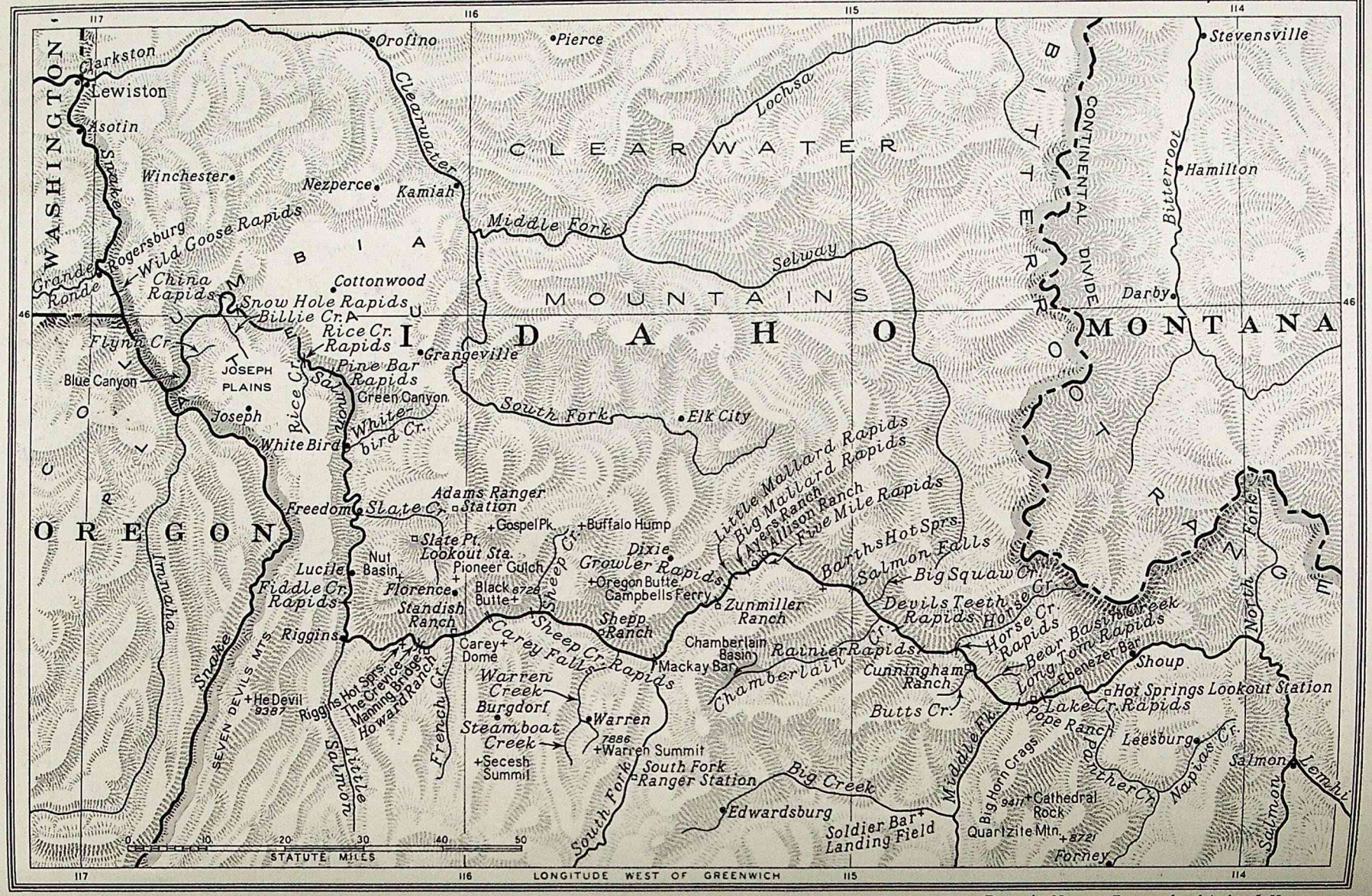
When we reached the boat, we found many people had motored down from Salmon to wish us godspeed on our 2,355-foot descent to Lewiston, 253 miles away.

Low light on the water made it difficult to see hidden rocks, and Captain Hancock suggested that we postpone our start until morning.

Though our scow had looked unwieldy, this advice seemed overcautious. "They're tired," we thought. But before the trip was over we had absolved our boatmen of undue caution and had developed a bit ourselves. We slept in a newly completed camp whence C.C.C. workers are pushing a road down the river with dynamite and "bulldozers," heavy tractors used for shoving obstructions out of the way.

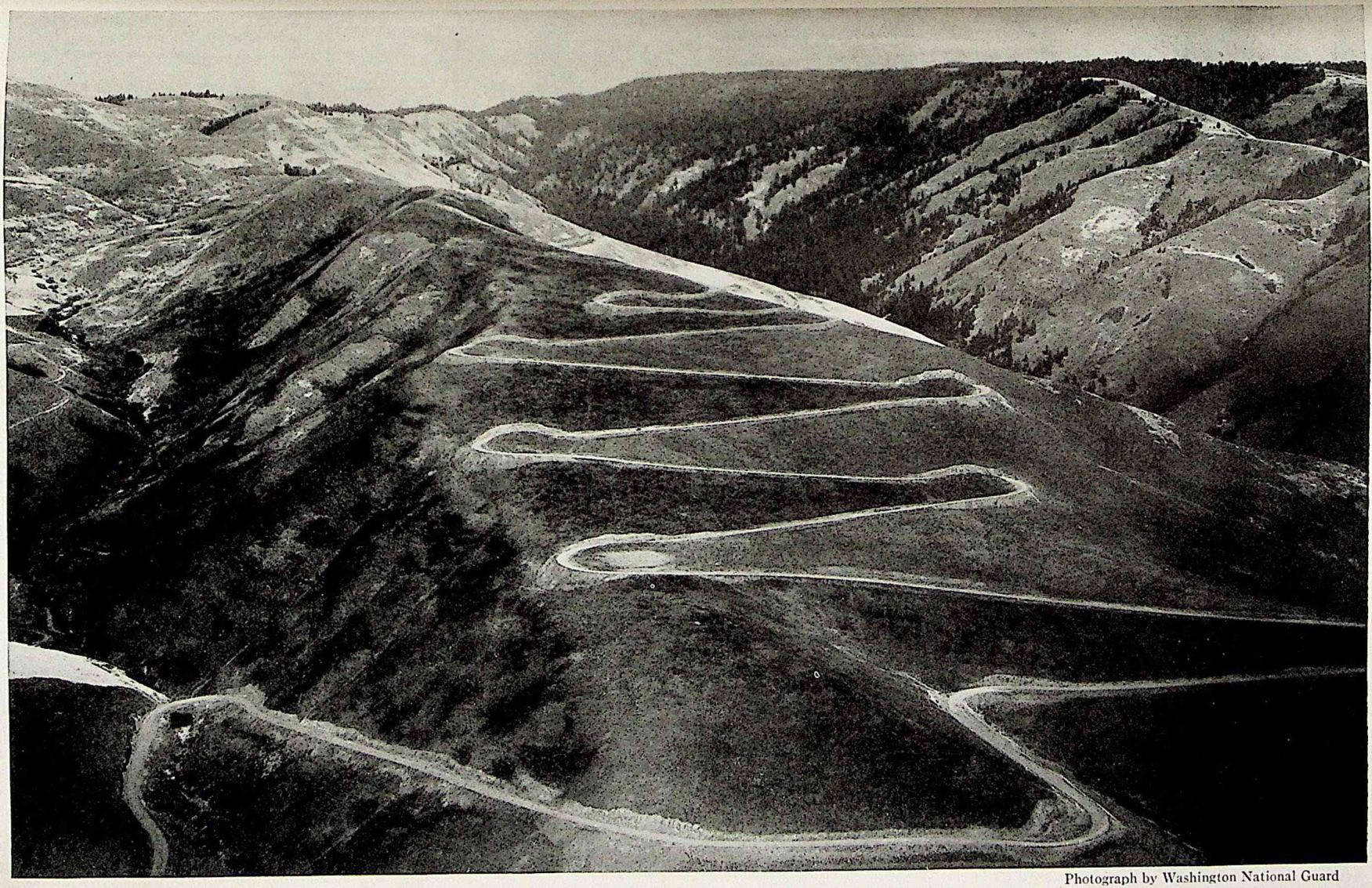
Dave Chard's "Come and get it," at daylight, referred to delicious sourdough hot cakes. Dave had installed his kitchen after leaving Salmon, and a full-sized iron range now sat in a corner of the scow, with work benches close at hand. Since the boat was heavily loaded and the water low in the Lake Creek Rapids, we struck out on foot immediately after breakfast.

We were greeted at the Pope Ranch by Mrs. Mills, an old-fashioned little lady who had read THE GEOGRAPHIC for many years and was familiar with Williams' articles. She said she had thought it possible that she might meet him in China or Afghanistan, but that she never had expected to be introduced to him in the Salmon River Canyon.



Drawn by Newman Bumstead and Arthur J. Hazes

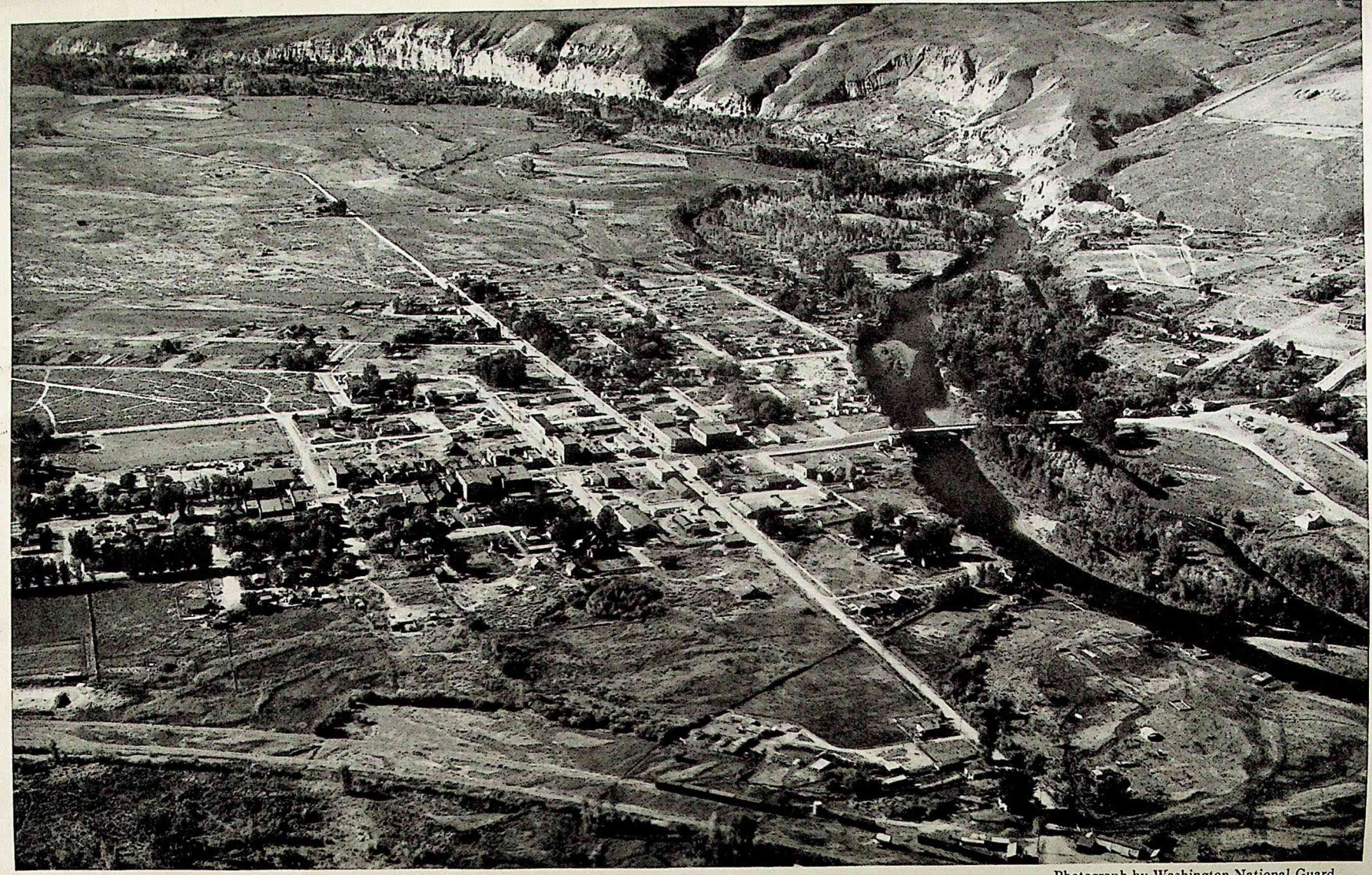
THE RIVER OF NO RETURN ROARS TUMULTUOUSLY THROUGH SOME OF THE RUGGEDEST MOUNTAIN COUNTRY IN THE UNITED STATES



Photograph by Washington National Guard

THE SWITCH-BACK ON IDAHO'S NORTH-SOUTH HIGHWAY ZIGZAGS UP A LAVA HILL BETWEEN WHITE BIRD AND GRANGEVILLE

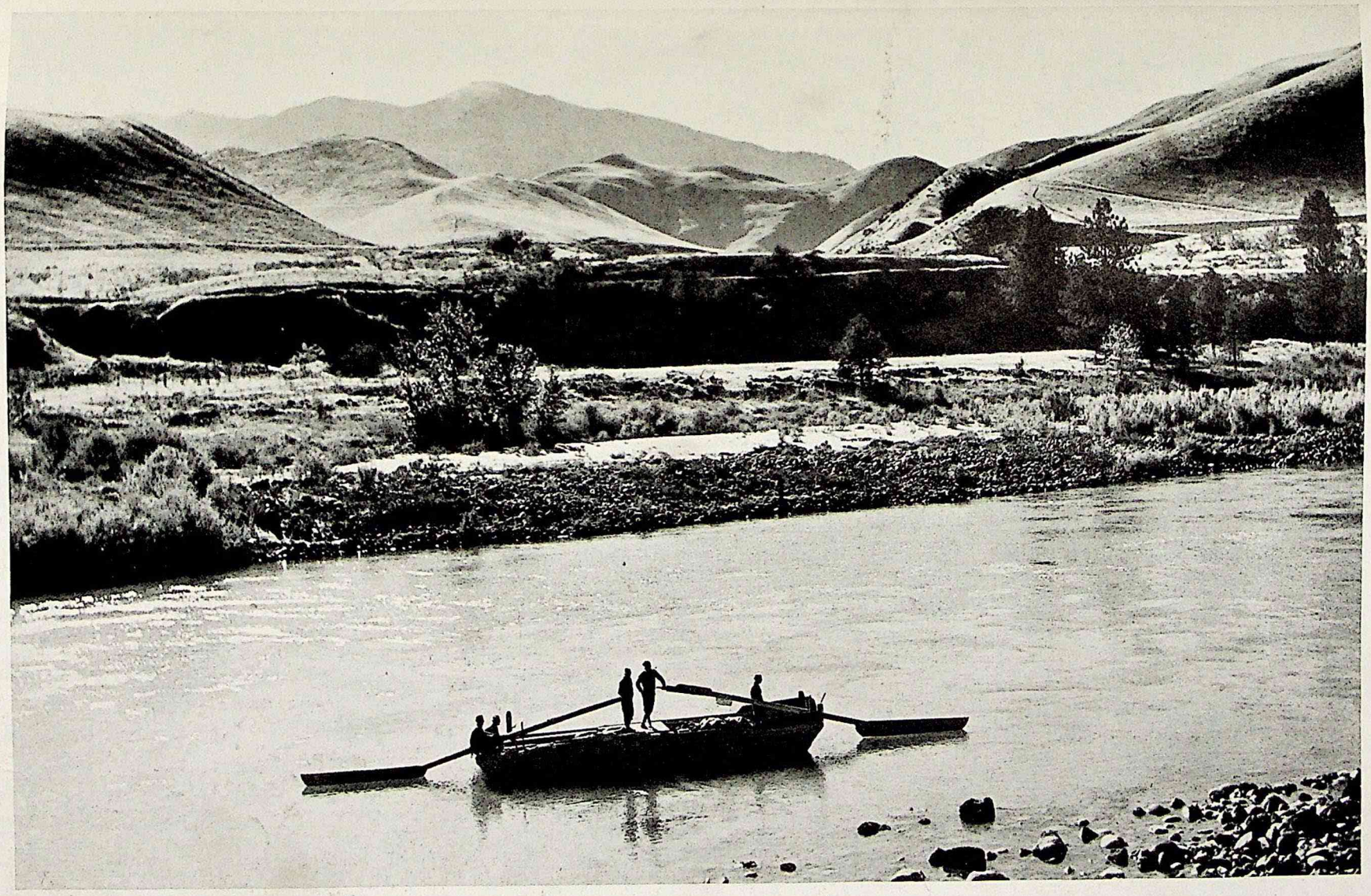
At the foot of this tortuous climb Chief Joseph and his band of braves, in June, 1877, fought one of the opening battles of the Nez Percé Indian war (page 96). Memory of the soldiers and Indians who gave up their lives is perpetuated by monuments close to the highway. The dark, burned-over area on the left side indicates that a recent grass fire failed to jump the road.



Photograph by Washington National Guard

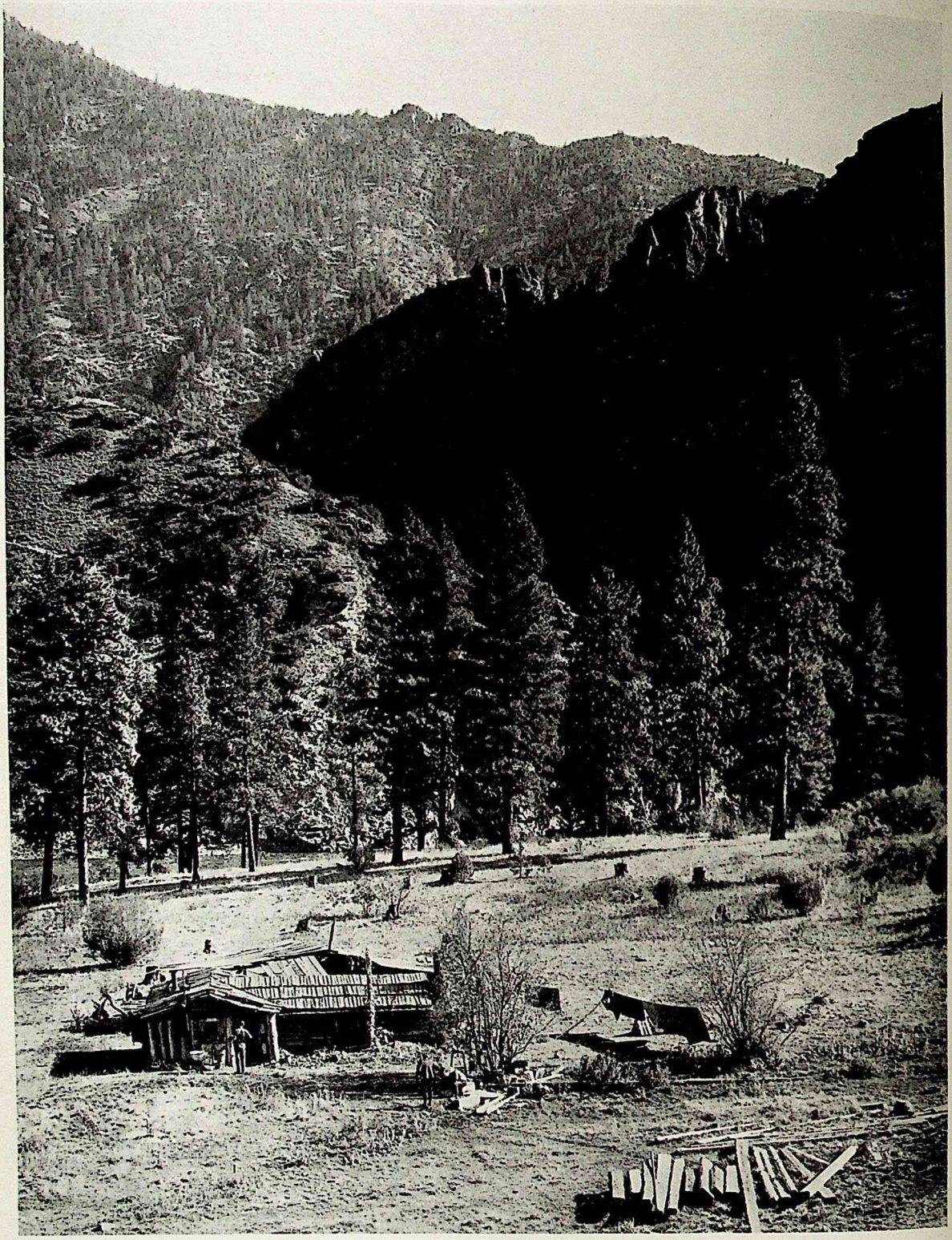
THE SCOW FIRST "SAW THE LIGHT OF DAY" AT SALMON, NEAR WHERE LEWIS AND CLARK CAMPED IN AUGUST, 1805

Captain Clark named the river for his fellow explorer, who was the first white man to set foot on its shores. The name was later changed to Salmon because of the fish that inhabit its waters. During the early gold-rush days of Leesburg, which lies about 10 miles west of here, a ferry was operated near the highway bridge above.



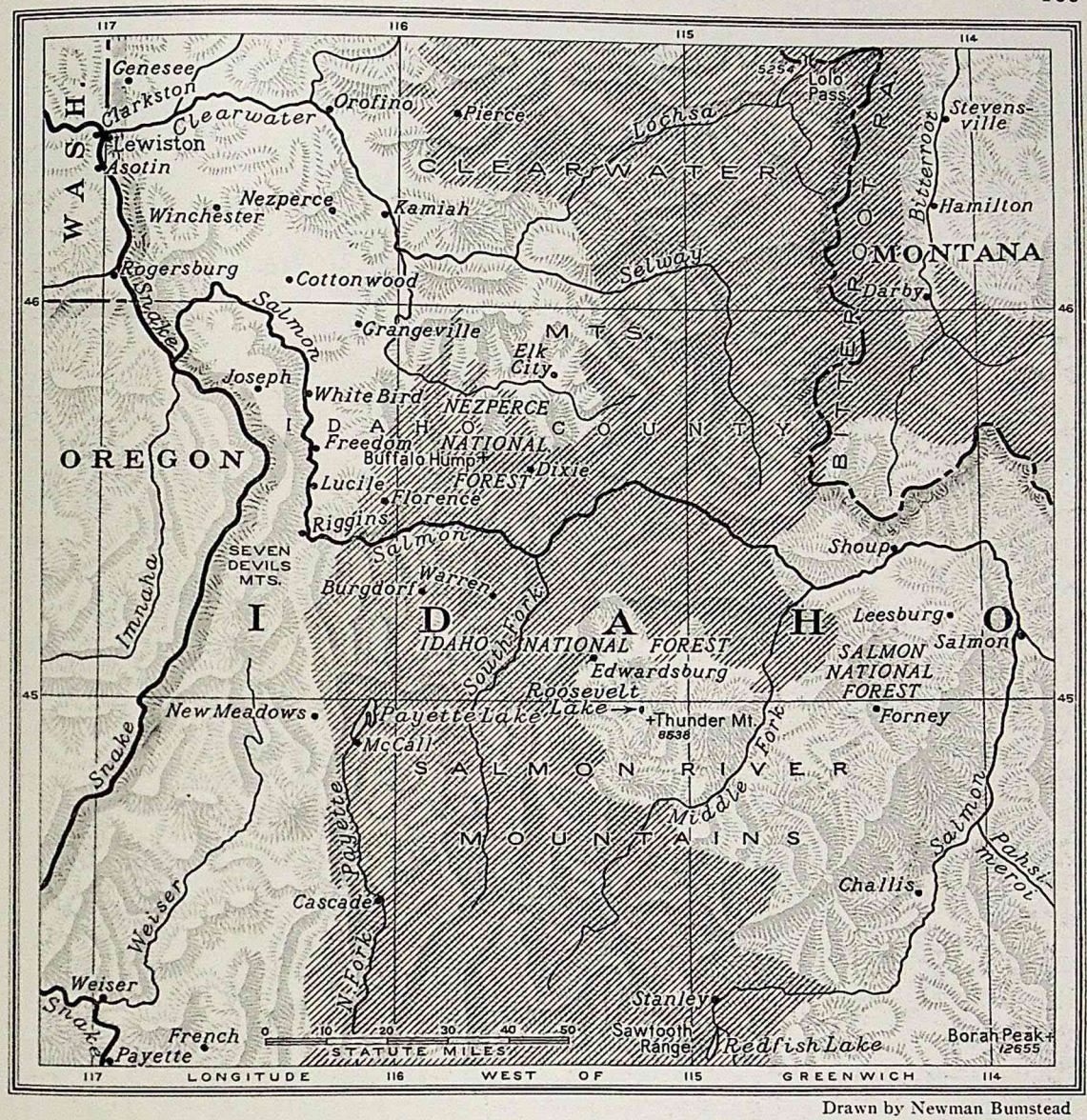
THE SCOW IDLES THROUGH QUIET WATER BELOW FREEDOM

The river once flowed through the gap in the background, but gradually wore a new channel through more easily eroded rock. Thus the stream has reversed the usual process of geology by making a circuitous horseshoe bend rather than following its more direct old course.



A HOMELY PARADISE NESTLES DEEP WITHIN ENCLOSING CANYON WALLS

The cabin lies on a low terrace surrounded by stately ponderosa pines. In it lives John Cunningham, the expedition's second boatman, whose chief outside contact is the NATIONAL GEOGRAPHIC MAGAZINE. After the crew had sampled Jack's watermelons, he showed them his fruit cupboard bulging with bright bottles of preserved raspberries, strawberries, peaches, and apricots, all raised in his garden (page 108).



Drawn by Newman Bumstead

SCIENTISTS SOUGHT TO DISCOVER THE EXTENT OF THE IDAHO BATHOLITH

This huge mass of granite (the shaded portion of the map) was long a challenge to geologists. In the trip down the Salmon River, the National Geographic Society-U. S. Geological Survey Expedition obtained valuable data on the colossal body of rock (page 136).

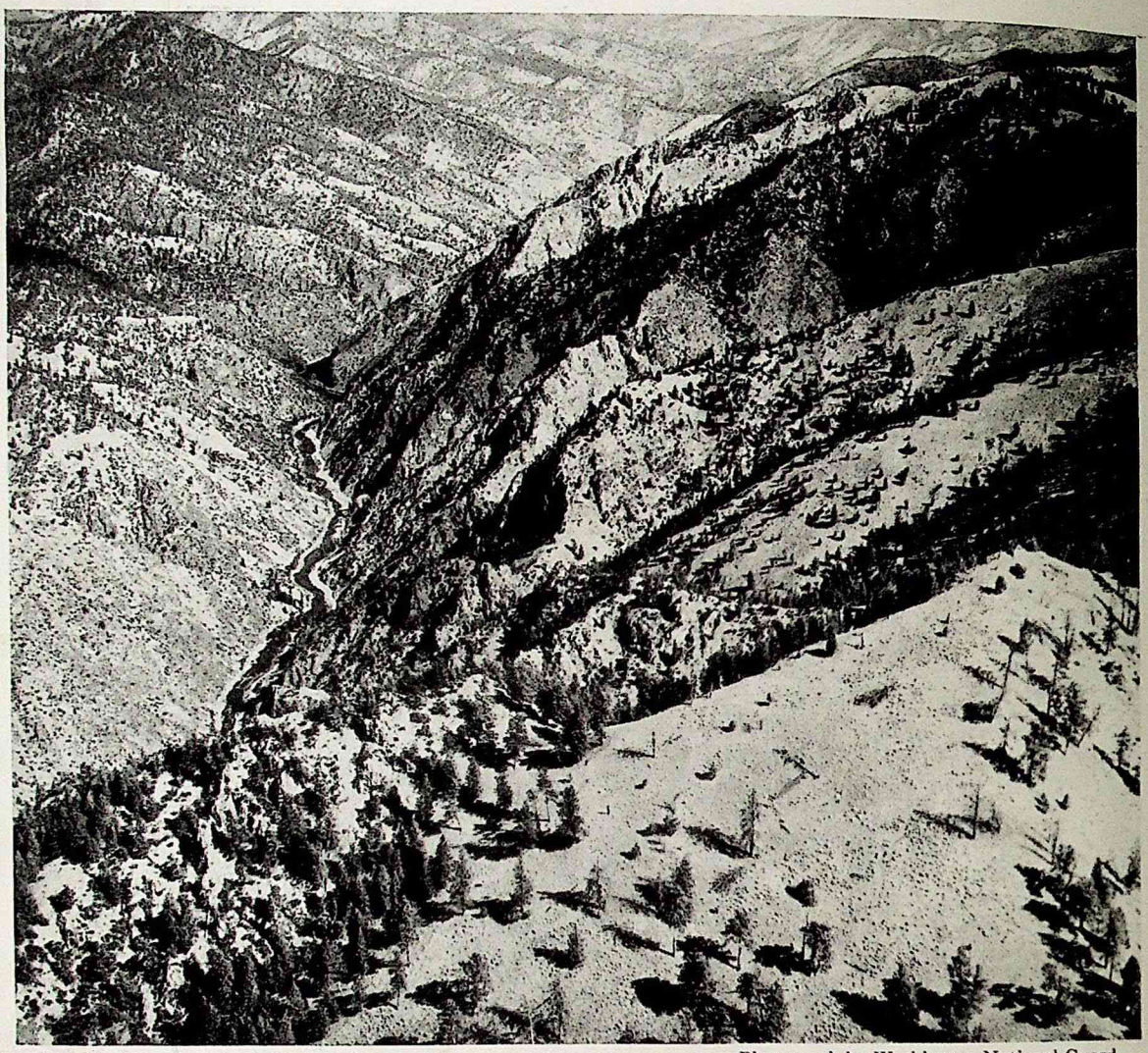
Jack Cunningham joined us, and we got into the scow. We were now embarked on the "River of No Return."

"SALMON RIVER, LET 'ER BUCK"

As we approached the Long Tom Rapids, we could see the expression change in the eyes of our boatmen. With faces set and bodies tense, they picked their way toward the white-flecked crest of roaring water. This lull before the storm we were later to experience many times. The roaring grew louder and louder, and ahead of us we could see "white water" dashing over partly exposed bowlders.

If there was a channel, our inexperienced eyes could not detect it. But on we went; there was no turning back. A quick surge, a rush of water, a few strokes of the sweeps, and we were through! At one moment a huge rock blocked our path. Then it lay behind. With each rapid our respect for the boatmen grew. Their timing and precision were perfect.

Near the mouth of the Middle Fork, Clyde Smith led us up to a high bluff, from



Photograph by Washington National Guard

HOT SPRINGS LOOKOUT STATION IS PERCHED PRECARIOUSLY ABOVE THE CANYON

From such vantage points (right) lookouts keep a constant vigil during the forest-fire season. To the right of the Salmon River, the new highway winds through the gorge and passes the town of Shoup, around the bend in the background.

which we could see steelheads (sometimes known as salmon trout) sporting in the crystal-clear water far below (page 94).

FISHING ON THE SIDE

With light tackle Dean Fahrenwald hooked a fifteen-pounder—one which jumped two or three feet clear of the water. It was beautiful to behold, its glistening green sides tinted with brilliant red. When we started up Middle Fork with the Smiths and Tom Ayers, Flint was carefully studying it while Clark and Fahrenwald were at work on the radio.

At the mouth of the Middle Fork we had not entered the Idaho Batholith, whereas in the Big Horn Crags country, less than 10 miles to the south, we had found solid granite. A short trip up the canyon might disclose its edge; therefore, while Clyde Smith, stripped to the waist, stood in the bow of his bateau, the rest of us, rubber shod, hauled on the towrope to the "Song of the Volga Boatman." Over slide rock and up steep bluffs we scrambled, while Clyde pushed and tugged with a long pole. Where we could neither scramble nor climb we took to the water (page 114).

At dusk, after three glorious miles, we reached an old camp. On each side of us walls of solid rock, forming a box canyon, rose straight toward the sky.

Far above our camp six mountain goats stood like statues, their white coats in



DENSE FOREST OF THE FLORENCE DISTRICT HIDES THIS CABIN

In their comfortable shelter the two sourdoughs (prospectors) in shirt sleeves will "batch it" through the long winter. By Christmas the snow will cover the eaves, but with a good supply of "grub" in their larder and summer promised by next June they face the future with a smile.



EVEN IN THE WILDS, THE MACHINE AGE HAS ARRIVED

A gasoline-powered washing machine, brought by river boat to this ranch deep in the canyon, helped the captain's sister-in-law perform her household duties much as they are done in the towns.

strong contrast with the dark rocks. When night closed in, they were still maintaining their silent vigil.

Next morning, although we had not found the batholith contact, we had to turn back and, with Don Smith at the head sweep and Clyde at the rear, we slid back down the Middle Fork, over thundering falls and rapids, with apparent abandon.

At one point the bright morning sun shone on an emerald-green bluff 500 feet above us. After scaling it, we were disappointed to find the copper stain only skin-deep and not the weathered outcrop of a real copper vein. We were reminded of the old saying that there is enough copper in a penny to stain a mountain.

Such disillusionment is the everyday fare of the hardy prospector in his constant search for gold. A few strike it rich, but most of them barely eke out "beans."

Back at our scow, Flint and Clark, in radio contact with Salmon, reported all well. Everyone was in high spirits, although Captain Hancock and Flint had colds.

At dusk we camped near the mouth of Bear Basin Creek a few hundred feet below some inventor's dream of a short cut to riches, a suction dredge. Since the machinery was still in place, it appeared that the inventor had only lately been rudely awakened.

Jack Cunningham's ranch, situated on an alluvial flat at the mouth of Butts Creek, is framed by high, jagged walls (page 104). Along the river, cottonwoods bedecked in yellow and gold rivaled the more brilliantly colored huckleberry and sumac bushes of the hillsides.

WHERE WILDERNESS IS PARADISE

In the rustic interior of Jack's cabin, which is reached only by boat or by Forest Service trail over the mountains to the north, were copies of the NATIONAL GEOGRAPHIC MAGAZINE since 1916, most of which he had practically committed to memory. His larder was stocked to overflowing with enough preserved fruits and jellies to cause any housewife envy, and from a corner he brought forth watermelons and two jars of home-made wine.

The garden furnishes fruits and vegetables, the cows and chickens supply milk and eggs, and the hillside behind the house yields meat in the form of venison, mountain goat, and bighorn sheep. The hydraulic placer mine below the orchard and an occasional boat trip supply funds for clothing, magazines, and books. Perhaps Paradise is like that!

A short distance below Jack's place a miner had constructed a crude water wheel by which old coffee and lard cans lifted the water into a trough (p. 120). This device, as it swished and creaked, reminded Williams of similar ones he had seen in Szechwan, China, and on the Oronte River in Syria.

We ended the day by shooting Horse Creek Rapids, much like a dozen others we had been through. Also, like most of the others, these rapids were formed by rocky alluvial fans deposited in the river by tributary streams. Above the fans the water is generally ponded to form the stretches of "polished water." At a sandbar just below a Forest Service pack bridge our Nimrods shouldered rifles and hit off up Horse Creek in an unsuccessful attempt "to replenish the meat supply."

Big game had thus far been scarce. The usual mid-September storms had not arrived, so most of the deer and bighorn sheep were still up in the high country.

BETWEEN WALLS IN THE IDAHO BATHOLITH

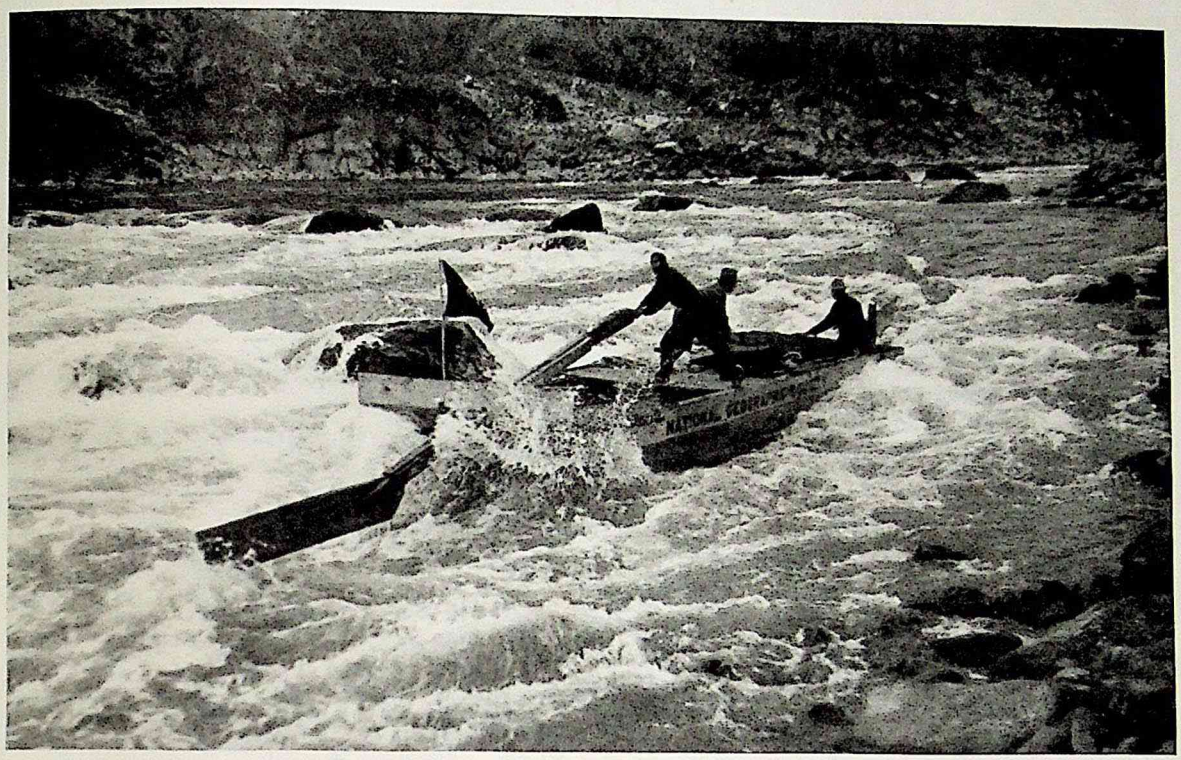
Below Horse Creek are some unusually fine Indian paintings high on a bluff. John E. Rees says these figures tell of a battle in which many warriors and a chief were killed (page 121).

Here, 20 miles farther downstream than we had expected, we entered the Idaho Batholith (p. 105). For the next 90 miles we were to pass between wide-spread canyon walls carved more than a mile deep almost entirely from this great granite mass.

The day was clear and warm. After stretches of polished water, clumsy rapids tumbled us about. But except in Rainier and Devils Teeth our anxious moments were few.

Next morning we inspected a quartz vein situated a half mile below Big Squaw Creek camp. Where exposed it was 30 to 50 feet wide, but it had a "lean" look. A new location certificate and recently dug pits served notice that some prospectors "had 'er made."

We were approaching Salmon Falls, the rapid that only two years before had almost taken the life of Captain Guleke. Now, because of unusually low water, it was particularly dangerous. To select the south



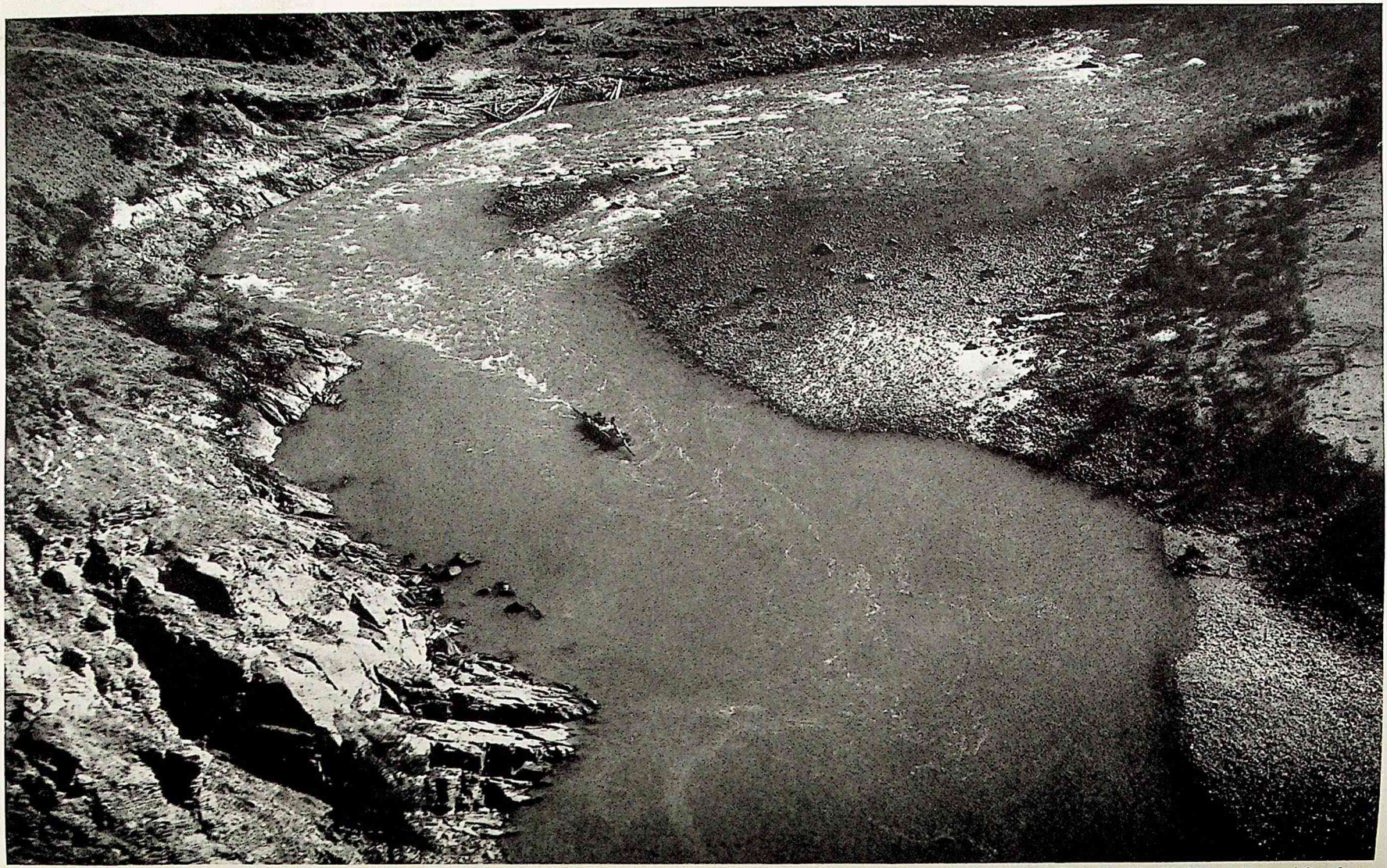
THERE WAS A ROAR OF RUSHING WHITE WATER; THEN CALM

A rapid in the lower canyon above Billie Creek, not dangerous in most years, was a real hazard because of the low stage of the river. All except the boatmen and Shenon, who had bruised his hip in Rice Creek Rapids, disembarked to lighten the craft.



THE SCOW LEAVES ITS BIRTHPLACE, NEVER TO RETURN

Because of exceptionally low water the good ship *National Geographic Society* is riding light and equipment will be loaded at Ebenezer Bar, at the end of the Salmon River road (page 94).



Photograph by Washington National Guard

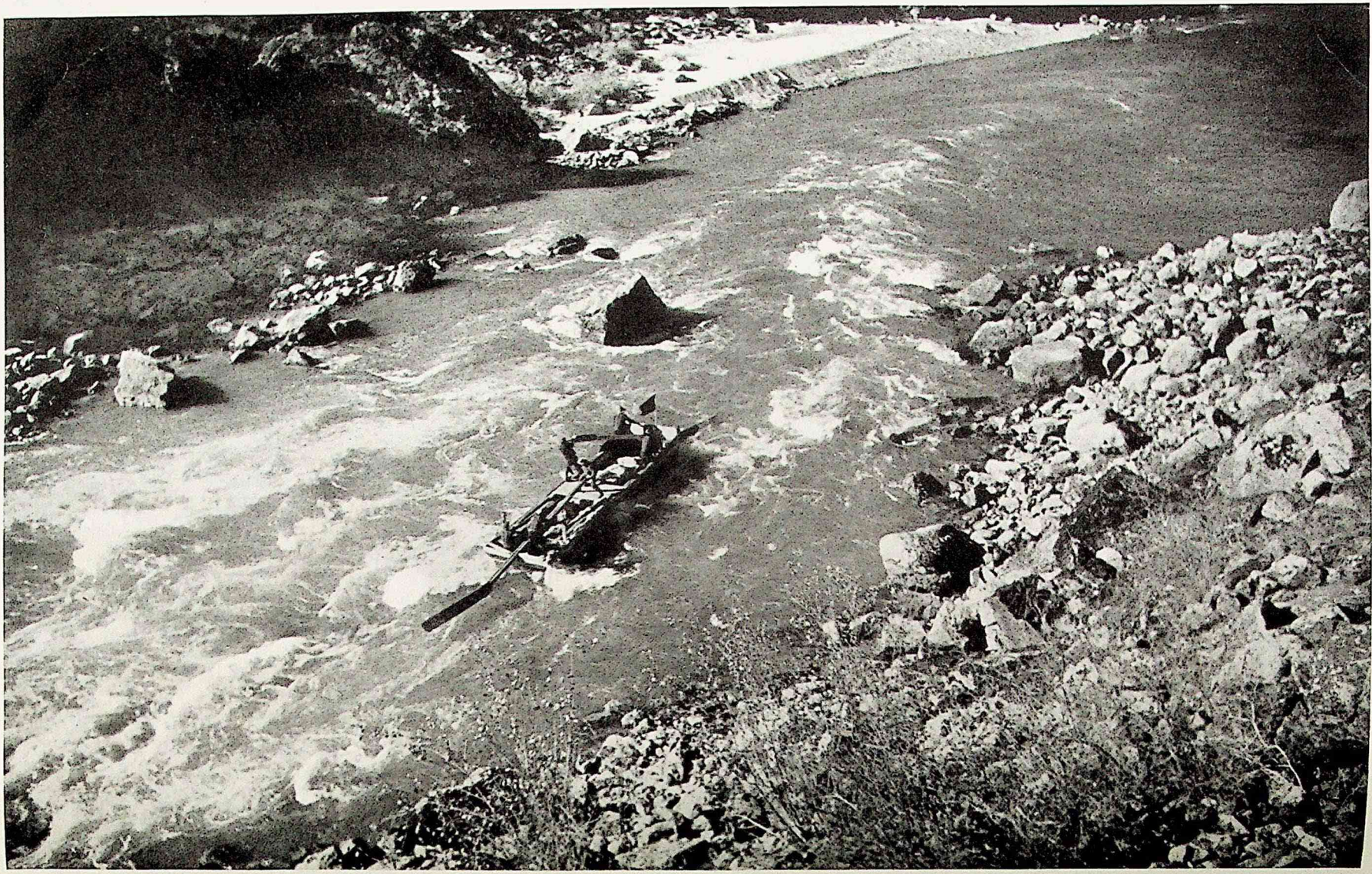
THE "WHITE WATER" NEAR RIGGINS LOOKS EASY AFTER THE UPPER CANYON

As the adventurers bade farewell to Riggins, the Washington National Guard plane with Hartnett and French aboard roared overhead, circled, and dipped its wings in salute. This scow is unusually seaworthy and tight. Little water was bailed from her bilges, and most of that came over the sides in spray. Canned goods were stored in the double walls of the boat, and a small kitchen stove was carried in one corner for the "galley."



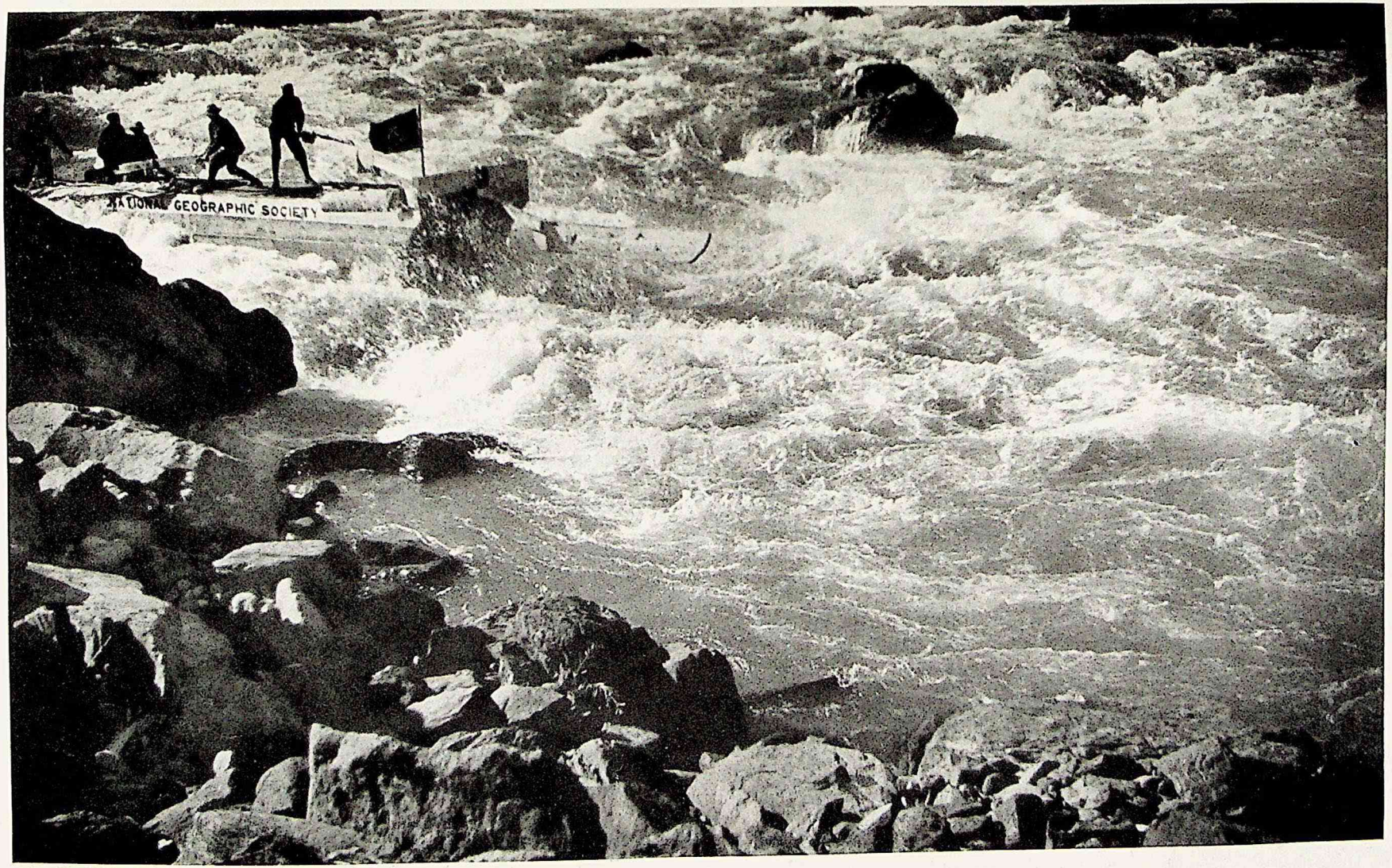
A MOMENT'S BREATHING SPACE PRECEDES THE MAD PLUNGE

With bodies tense the boatmen "ease" into the chosen channel. Snow Hole Rapids, which fall 10 feet in 150, give the crew some of their most anxious moments. A few inches too far to the right or left might spell disaster (page 112). Sweeps have no sculling action at all; they are used merely for steering. Unlike a rudder, they are held above the surface except when needed to sweep the craft clear of an object or keep it on the course. No power was provided for the boat; it simply floated downstream with the current.



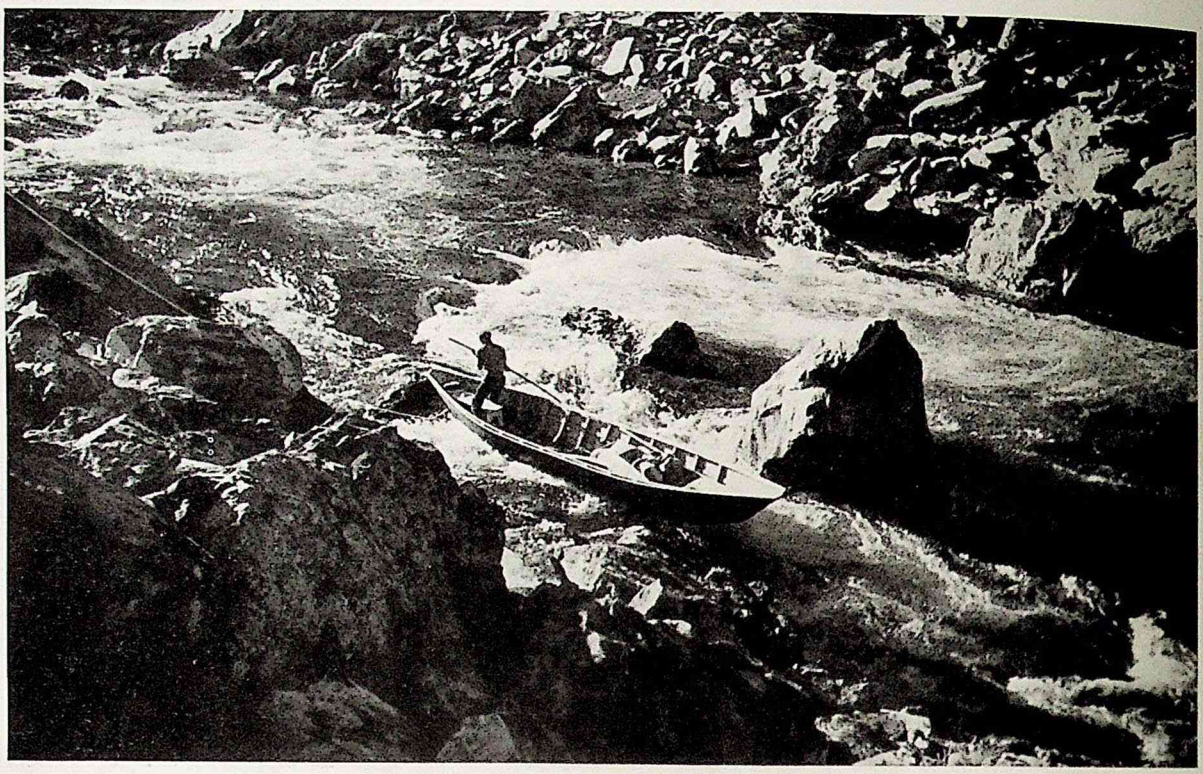
IN MIDSTREAM A THRUST-UP ROCK LOOKED AWESOME AS GIBRALTAR

A few quick tugs on the sweeps, the roar of the water around the scow, and the adventurers were through Snow Hole Rapids, one of the most dangerous on the river at the extremely low stage of water (page 111). There were many such wild rides "between Scylla and Charybdis."



FIDDLE CREEK RAPIDS ARE NO PLACE FOR PLEASURE PADDLING!

The thunder of the rapids, the faint shouts of the crew, and the express-train speed of the boat seem expressed by this picture of a breath-taking ride. For 33 miles below Riggins the North-South Highway follows the Salmon River. Crowds along the road, after watching the scow "take" one rapid, rushed ahead to the next. They had one opportunity to make return for their entertainment by pulling the craft off the rocks.



THE BOX CANYON OF THE MIDDLE FORK PUT UP ACTIVE RESISTANCE

While four of the party tugged to the tune of the "Volga Boatman," Clyde Smith pushed and pried to keep his small craft off projecting rocks.



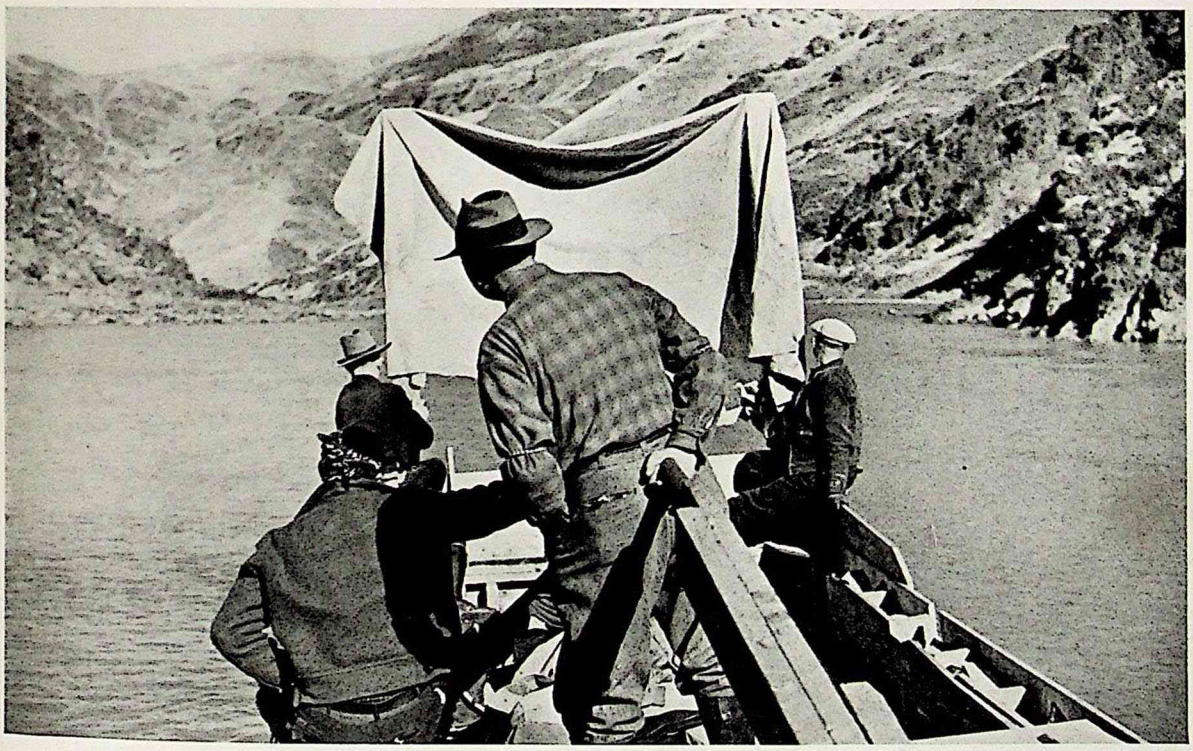
A QUIET STRETCH ON THE MIDDLE FORK MEANT TOIL FOR SOME

While his fellows scrambled over slide rock or bluffs with the towrope, Clyde Smith stood poised to push his bateau away from submerged rocks. Where the towing crew could neither scramble nor climb, they took to the water with the rope.



SALMON FALLS TOSSED THE SCOW UPON PROJECTING ROCKS

Here the rocks almost proved the expedition's undoing. While two prospectors pried with a long pole, Williams, after taking this picture, braced his back against a huge bowlder and pushed with his feet.



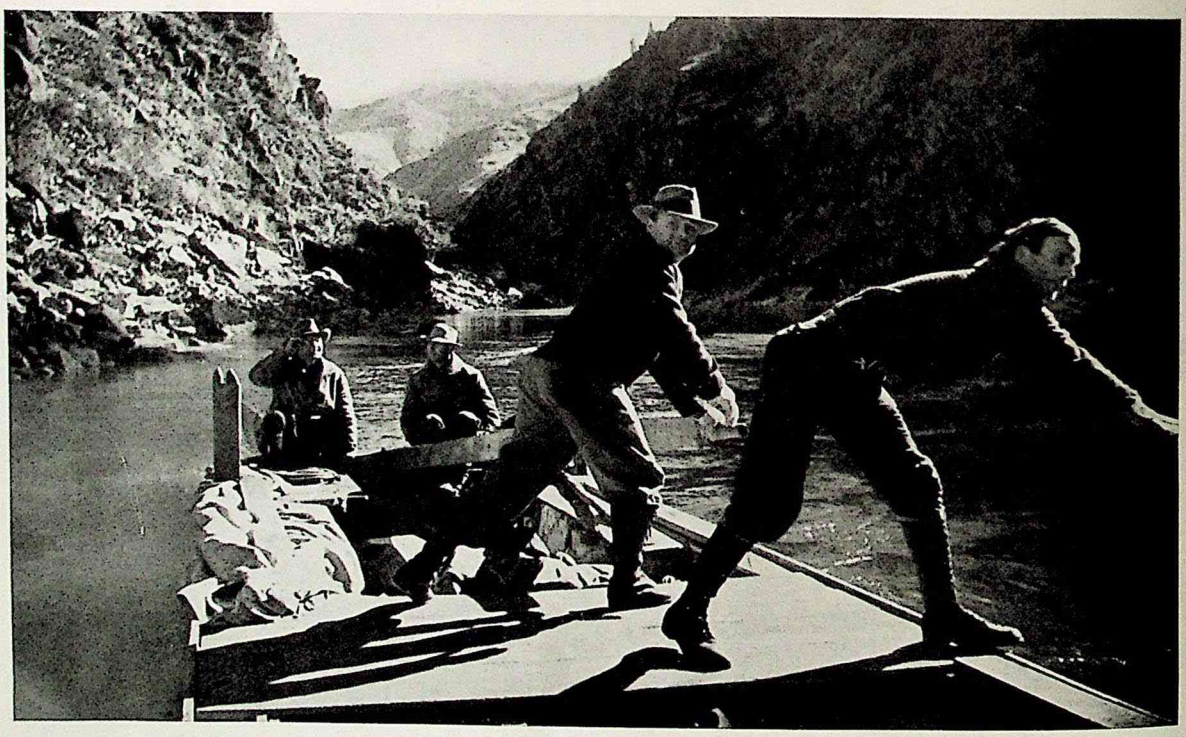
THE SAIL PROVED MORE OF A HINDRANCE THAN A HELP

Reed and Chard tried to make the scow a "windjammer" in a stretch of "polished water," but their scheme was not entirely successful because the tarpaulin obstructed the view of the boatmen and the wind started to blow upstream.



RAPIDS AHEAD! THERE'S THE COURSE!

The short log attached to the sweep near Captain Hancock's hand balanced the steering device like a laboratory scale. About midway through the canyon the boatman replaced his first piece of sapling by another, for the green wood had dried out enough to become lighter than he liked.



QUICK FOOTWORK PREVENTED THE SCOW'S BEING SUCKED SIDEWISE INTO A RAPID

Here in the Green Canyon, as elsewhere, a wrong choice of channel might have meant disaster. At some bad places the boatmen went ahead on the bank to pick the best course. Care was taken going down rapids, for if the bow sweep should "trip" or become caught in an eddy, the handle would be wrenched violently from the boatman's hands and the craft would be out of control.

channel would probably spell disaster; to use the north one almost certainly meant a hang-up on protruding rocks.

With a creak and a groan the boat slid upon the bowlders and stopped short—stuck fast! Two placer miners, who had come to watch the fun, dashed to the rescue. With a long pole they pried while the boatmen tugged on their sweeps. Williams, lying flat with his shoulders against a rock, shoved with both feet (p. 115). Grudgingly the boat gave way and then, like a fallen warrior running the gauntlet, it was off again with a rush between lines of bowlders.

At Barths Hot Springs a copious flow of hot water issues from joints in the granite. Its temperature, about 134 degrees Fahrenheit, is hotter than we could stand. The river was 54 degrees Fahrenheit, too cold for comfort.

Where a big stream of hot water joined the cold, we underwent the peculiar sensation of standing in a bathtub in which the water chilled our feet and at the same time nearly scalded our shoulders.

Flint felt better after his bath, but during the rainy night he somehow rolled out of bed, and before he was thoroughly awake was wet to the skin. In the morning he was weak and we decided to rush him to a hospital. Reed walked ahead to a Forest Service phone. The rest of us broke camp, carried Flint to the boat, and set out in the rain.

Arrangements were made for a plane piloted by Dick Johnson, Flint's buddy on many a hazardous trip, to fly from Missoula, Montana, to Mackay Bar, a flat terrace which is the only emergency landing field in the canyon. Even that was 25 miles away—two days by boat. Everything else was forgotten. We had to get Flint out!

THE RIVER BARES ITS TEETH

A mile below Allison's ranch we escaped disaster. All except Dave Chard, Flint, and the boatman had unloaded for a rapid which, except for being shallow, did not look particularly bad. However, as the boat swung to avoid one bowlder it smashed into another with enough force to throw it partly out on the shore. For an instant it perched at a dizzy angle and then glided back into the water.

We touched at the Ayers ranch only long enough for Captain Hancock to say hello to his wife and then on we splashed through the Big Mallard and Little Mallard Rapids to the Growler Rapids.

With Flint confined to his sleeping bag, we could take no chances. Hancock chose the safer but shallower channel, toward which the heavy boat plunged at top speed. Then a sickening creak and groan, and we were stuck, this time on a three-point suspension that held with viselike tenacity.

For two hours we pried and pulled, to no avail. The dean cut a long pole while the rest of us tediously unloaded the boat over a slippery bridge of saplings. Then, with a rope tied two feet or so from the bottom end, we applied the tree-trunk lever and, led by Representative Clark, pulled as never before (page 123).

The boat moved inches. Again we pulled. It moved a foot, then two feet, then slipped free. Though darkness was upon us, we pushed on to the hospitality of Joe Zunmiller's ranch, where Flint was given broth and placed in a warm bed.

The early-day trail to Thunder Mountain crosses the river at this place, known as Campbells Ferry. Near it we found hundreds of dikes cutting the granite. They line up with the dike zone of the Edwardsburg district, where they are closely associated with gold deposits.

AN AIRPLANE TO THE RESCUE

In the cold dawn we carried Flint down to the scow on an improvised stretcher. On through rapids and polished water we hurried. At noon we chatted a few minutes with Mrs. Jones and Mr. Painter.

On the previous day, this fine old gentleman had celebrated his seventy-fourth birthday. Years before, he had hired Captain Guleke to float from Salmon nine boatloads of machinery, which is now installed at his mine. Although one boat was wrecked, Captain Guleke had delivered all the machinery.

The moment the boat touched shore at Mackay Bar, we climbed to the landing field, to find Dick Johnson, who had just landed, looking for us. While he was cruising about, seeking a place to land in the depth of the canyon, his gasoline supply had run low and he had made a side trip to replenish it from a Forest Service cache in Chamberlain Basin.

After seeing the landing field, we could well understand why this small, powerful plane had been selected. We arranged an improvised bed in the front cockpit, bundled Flint in his sleeping bag, and fastened two safety belts securely over all (page 124).

As he bade us farewell, his last words were: "Well, fellows, if the doc lets me, I'll join you at Riggins," and then up into the familiar and friendly sky he sailed with his old flying comrade, winging his way toward the "Great Divide."

While we made camp, two visitors approached us. One of them, a former trapper named Moore, had been badly mangled several years earlier by the explosion of a box of giant caps when he started a fire in a deserted cabin. He had suffered four days of agony before his partner arrived.

Today Mackay Bar landing field is a monument to the suffering Moore endured. This crippled man cleared it himself so that if others in this back country should meet with misfortune their trials would be less than his. To this field Dick Johnson had dropped from the sky for his last rendezvous with his old air buddy, Howard Flint.

Flint's death in Missoula, Montana, while the expedition was in progress took from us a beloved companion and ended the career of a true scientist. He was an avid student, and his many years of experience as Forest Supervisor, aerial photographer, and Regional Forest Inspector had enriched him with encyclopedic knowledge of mountain lore.

The next morning a big yellow and green plane bearing the insignia of the Washington National Guard hove in sight. Our friends Hartnett and French were with us again. Three times they tried to bring their plane down on the tiny field, but had to zoom past to avoid the hills.

Shortly after we passed the mouth of the South Fork, a message fluttered to earth. Not having heard about Flint's sickness, they were at a loss to know why they could not reach us by radio. Flint alone knew how to operate ours. From the Shepp ranch, a few miles farther downstream, we sent them a message of explanation.

ROMANCE FROM PIONEER DAYS

Across the river stood the former house of Polly Bemis, "the Chinese slave girl," about whom many legendary tales have been told.

We asked an old-timer, "Is it true Polly was won in a poker game?"

"Well," he replied, lifting the greasy brim of his old hat to scratch his head, "poker had something to do with it. Warren was a wild town in those days and gold dust and poker chips seemed to reach out toward each other.

"But Polly? It's a shame to spoil a good story. They're getting scarce. But I guess the fact was that Bemis got hurt in a poker game, Polly nursed him back to health, and Nature and a minister did the rest."

For many years the generous hospitality of Polly and her husband was a byword among the mountain people. Her death, three years ago, removed Salmon River's most romantic figure.

The Forest Service cabin at the mouth of Sheep Creek was occupied by miners, so we spread our beds on the sandbar.

Next morning, after collecting samples of concentrates from one of the sluice boxes, we passed through several exciting rapids, including Sheep Creek and Carey Falls.

A stiff up-river breeze developed in the afternoon and in stretches of polished water we "spelled off" on some crudely improvised oars.

ROADS UNLOCK THE MOUNTAINS

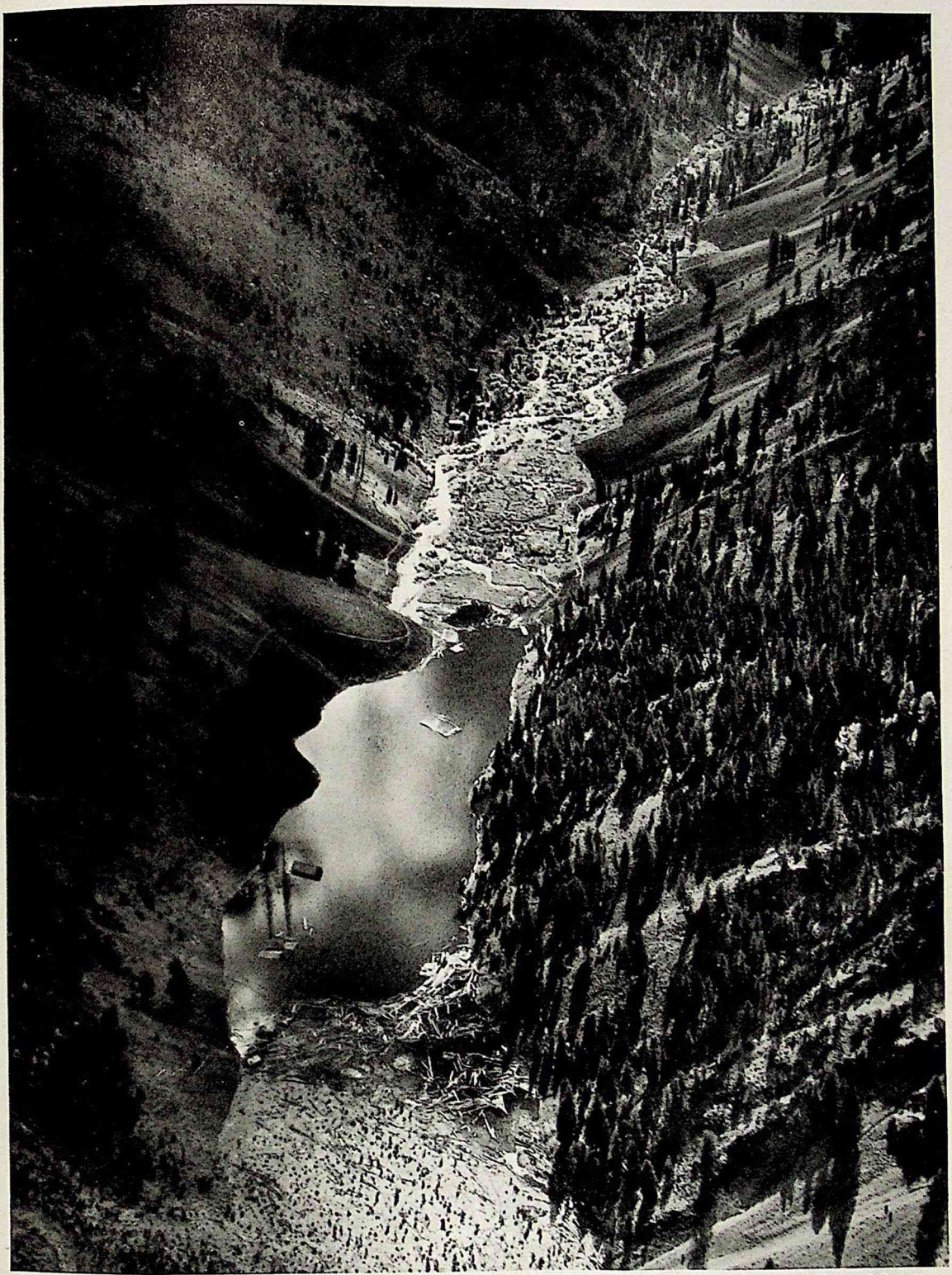
Near French Creek we heard blasts, and saw rocks falling into the river. For the first time in a hundred miles we were now in sight of a road. As we drew closer, we could make out C.C.C. boys, like ants on the hillside, drilling or prying away at bowlders.

We stayed that night at the C.C.C. camp, and next morning two New York boys waked us while kindling a fire. When it was going well, we ventured out of the blankets. We missed our downy sleeping bags under a canopy of clouds and stars; but a roaring stove and a dry floor on a frosty morning were easy to take.

With the officers of the French Creek camp and Ranger Briggs and Fritchman of the ever-helpful Forest Service, we left our scow and started the long automobile climb out of the canyon to have a look at mining and forestry activities. From a bend we could see the road weaving back and forth above us, in and out of a small valley, in a breath-taking series of switch-backs.

This road is one of an amazing number built in the last few years by the Forest Service and the C.C.C. (page 127). Supplemented by mountain-meadow airplane fields, such highways have revolutionized transportation in central Idaho. Last summer when the Warren baseball team played Elk City, 40 miles away across the canyon, the team went by plane in 20 minutes.

The present road distance is about 140 miles, practically all mountainous, but still



Photograph by Washington National Guard

STREETS ONCE TROD BY THE HOBNAILED BOOTS OF PROSPECTORS LIE BENEATH THIS MOUNTAIN LAKE

In 1909 a landslide started at the Dewey Mine on Thunder Mountain. It flowed three miles down Mule Creek Canyon, dammed Monumental Creek, and flooded the mining town of Roosevelt, causing its abandonment. The few buildings that still jut above the resulting Roosevelt Lake are now the homes of beaver and rainbow trout.

As he bade us farewell, his last words were: "Well, fellows, if the doc lets me, I'll join you at Riggins," and then up into the familiar and friendly sky he sailed with his old flying comrade, winging his way toward the "Great Divide."

While we made camp, two visitors approached us. One of them, a former trapper named Moore, had been badly mangled several years earlier by the explosion of a box of giant caps when he started a fire in a deserted cabin. He had suffered four days of agony before his partner arrived.

Today Mackay Bar landing field is a monument to the suffering Moore endured. This crippled man cleared it himself so that if others in this back country should meet with misfortune their trials would be less than his. To this field Dick Johnson had dropped from the sky for his last rendezvous with his old air buddy, Howard Flint.

Flint's death in Missoula, Montana, while the expedition was in progress took from us a beloved companion and ended the career of a true scientist. He was an avid student, and his many years of experience as Forest Supervisor, aerial photographer, and Regional Forest Inspector had enriched him with encyclopedic knowledge of mountain lore.

The next morning a big yellow and green plane bearing the insignia of the Washington National Guard hove in sight. Our friends Hartnett and French were with us again. Three times they tried to bring their plane down on the tiny field, but had to zoom past to avoid the hills.

Shortly after we passed the mouth of the South Fork, a message fluttered to earth. Not having heard about Flint's sickness, they were at a loss to know why they could not reach us by radio. Flint alone knew how to operate ours. From the Shepp ranch, a few miles farther downstream, we sent them a message of explanation.

ROMANCE FROM PIONEER DAYS

Across the river stood the former house of Polly Bemis, "the Chinese slave girl," about whom many legendary tales have been told.

We asked an old-timer, "Is it true Polly was won in a poker game?"

"Well," he replied, lifting the greasy brim of his old hat to scratch his head, "poker had something to do with it. Warren was a wild town in those days and gold dust and poker chips seemed to reach out toward each other.

"But Polly? It's a shame to spoil a good story. They're getting scarce. But I guess the fact was that Bemis got hurt in a poker game, Polly nursed him back to health, and Nature and a minister did the rest."

For many years the generous hospitality of Polly and her husband was a byword among the mountain people. Her death, three years ago, removed Salmon River's most romantic figure.

The Forest Service cabin at the mouth of Sheep Creek was occupied by miners, so we spread our beds on the sandbar.

Next morning, after collecting samples of concentrates from one of the sluice boxes, we passed through several exciting rapids, including Sheep Creek and Carey Falls.

A stiff up-river breeze developed in the afternoon and in stretches of polished water we "spelled off" on some crudely improvised oars.

ROADS UNLOCK THE MOUNTAINS

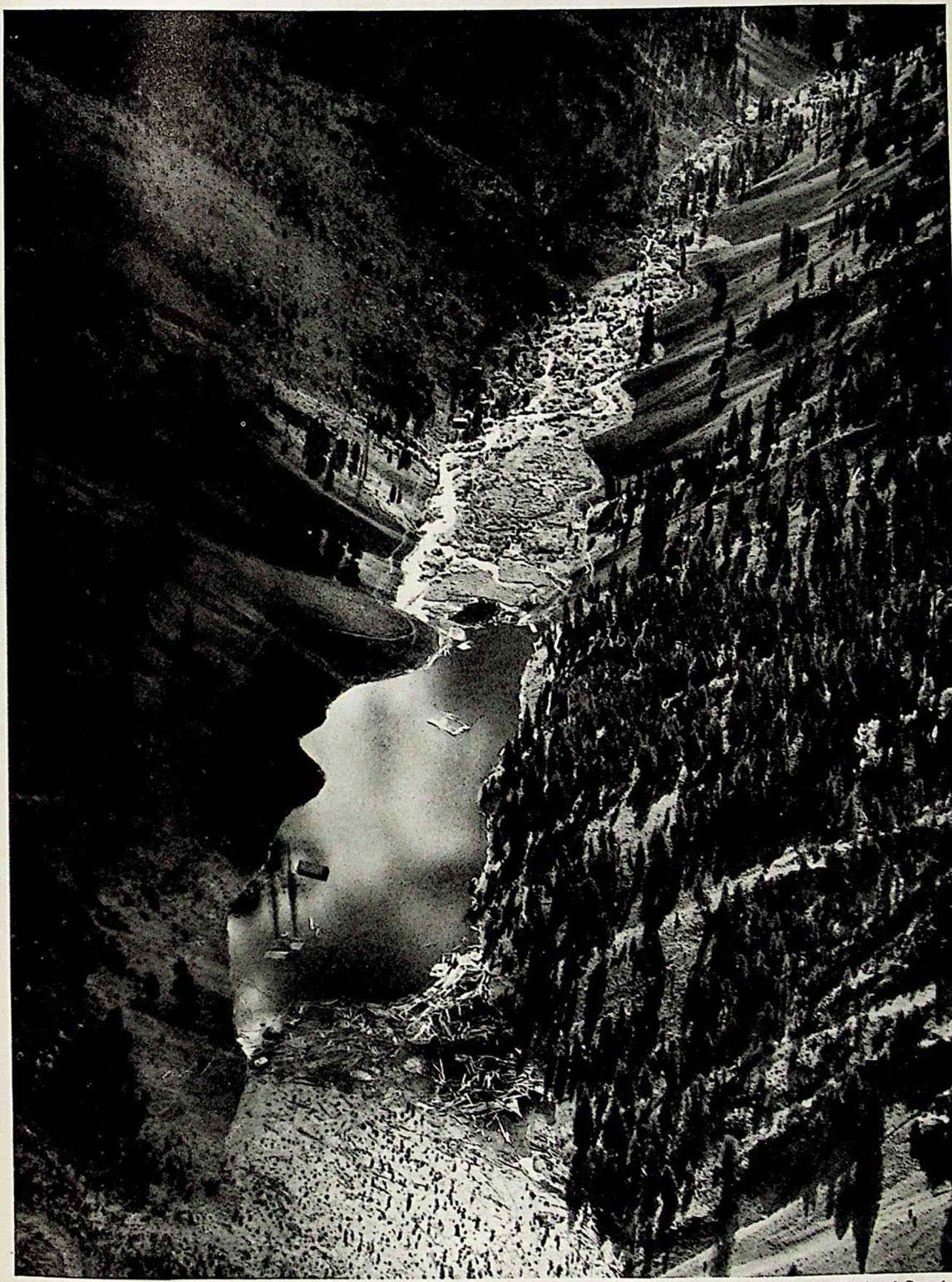
Near French Creek we heard blasts, and saw rocks falling into the river. For the first time in a hundred miles we were now in sight of a road. As we drew closer, we could make out C.C.C. boys, like ants on the hillside, drilling or prying away at bowlders.

We stayed that night at the C.C.C. camp, and next morning two New York boys waked us while kindling a fire. When it was going well, we ventured out of the blankets. We missed our downy sleeping bags under a canopy of clouds and stars; but a roaring stove and a dry floor on a frosty morning were easy to take.

With the officers of the French Creek camp and Ranger Briggs and Fritchman of the ever-helpful Forest Service, we left our scow and started the long automobile climb out of the canyon to have a look at mining and forestry activities. From a bend we could see the road weaving back and forth above us, in and out of a small valley, in a breath-taking series of switch-backs.

This road is one of an amazing number built in the last few years by the Forest Service and the C.C.C. (page 127). Supplemented by mountain-meadow airplane fields, such highways have revolutionized transportation in central Idaho. Last summer when the Warren baseball team played Elk City, 40 miles away across the canyon, the team went by plane in 20 minutes.

The present road distance is about 140 miles, practically all mountainous, but still



Photograph by Washington National Guard

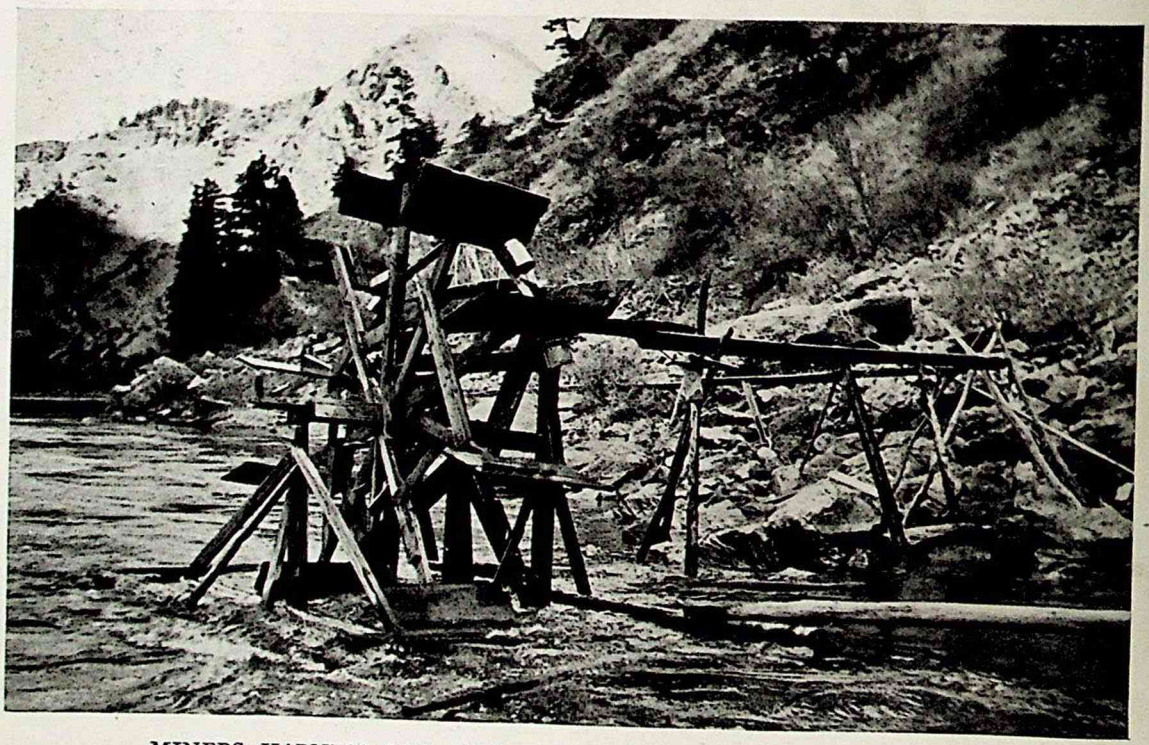
STREETS ONCE TROD BY THE HOBNAILED BOOTS OF PROSPECTORS LIE BENEATH THIS MOUNTAIN LAKE

In 1909 a landslide started at the Dewey Mine on Thunder Mountain. It flowed three miles down Mule Creek Canyon, dammed Monumental Creek, and flooded the mining town of Roosevelt, causing its abandonment. The few buildings that still jut above the resulting Roosevelt Lake are now the homes of beaver and rainbow trout.



THE RED MAN NOW REACHES HIS HUNTING GROUND BY AUTOMOBILE

The adventurers met these members of the Nez Percé tribe while they were on their way into the Nezperce National Forest to shoot deer. The old brave cannot speak English, but through an interpreter he said he well remembers the Nez Percé war of 1877. Comparison of the man's hands with those of his wife illustrates the Indian custom of letting the squaws do the manual labor.



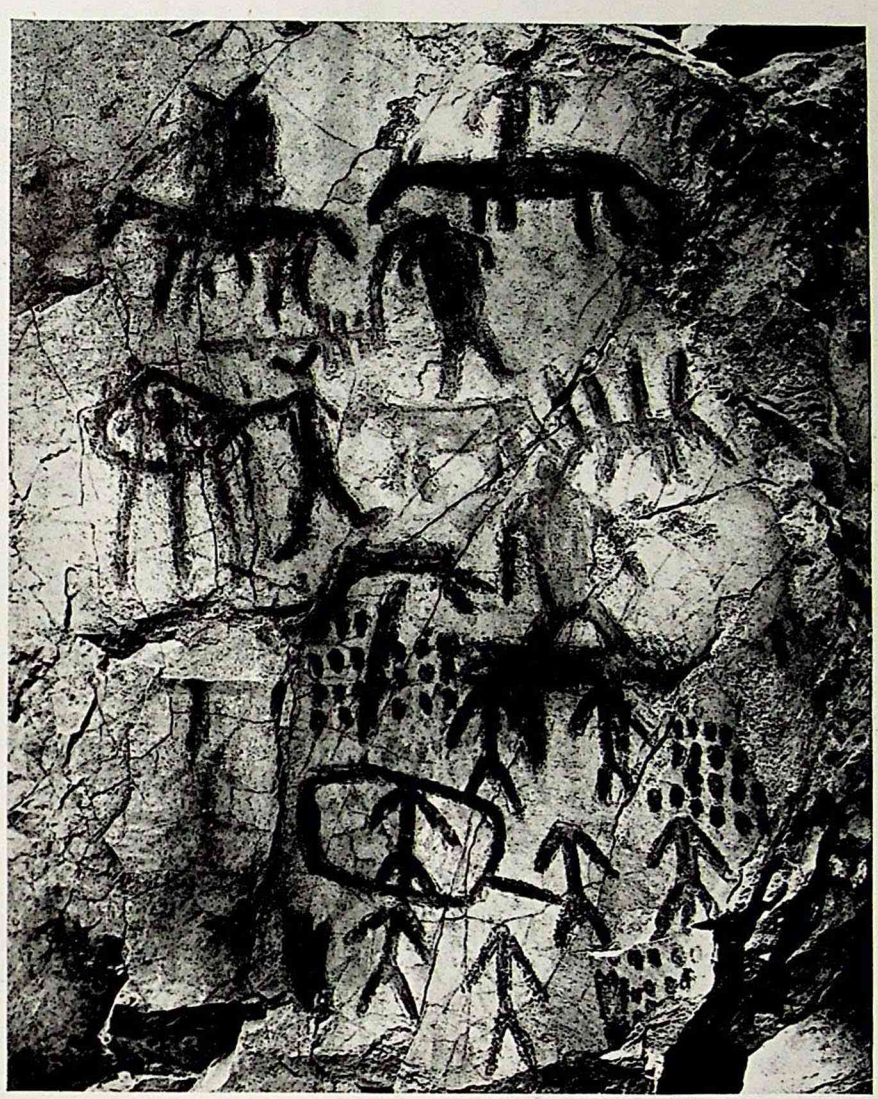
MINERS HARNESS THE SALMON TO SEPARATE GOLD FROM DROSS

So swift is the current that it easily turns the crude paddles of this wheel. Coffee cans fastened on the wheel scoop up water and pour it into the trough. Led to a sluice box on a trestle, it washes the earth and gravel and leaves the precious metal on the bottom.

good enough to make an easy day's drive. Only about five years ago, however, the road distance was 225 miles, and much of it steep and rocky, so that at least three days would have been required for the trip.

Pack train and foot travel are still in vogue in large areas yet inaccessible by road, and will be for many years to come.

The mountain hotel, store, and few cabins that constitute Burgdorf have grown up beside a freely flowing hot spring in which the natives bathe outdoors, even in the dead of winter with the temperature at 40 degrees below zero. Faces are surrounded by a heavy coating of frost as bathers dash to the warmth of the glowing hotel stove.



PRESENT-DAY INDIANS CANNOT READ THESE PICTOGRAPHS

John E. Rees, a student of Idaho Indian history, says this group on the north side of the river below Horse Creek records a battle in which many braves and a chief were killed. The paintings are in red on a gray background. The nature of the pigment has not been determined, but it has soaked into the rock for about a sixteenth of an inch and is not just a surface coating (pages 99, 108).

This is the only settlement for miles. Twenty-seven miles away (as the crow flies) over Secesh Summit lies McCall, at the south end of Payette Lake. Twelve miles eastward Warren still mines gold; and 22 miles northwestward, on Salmon River, is Riggins, on the Idaho North-South Highway.

A short divergence took us to a tall steel tower on Carey Dome whence an unobstructed panorama stretches in all directions.

To the northward, at our feet, yawned the mighty canyon, more than a mile deep and about eight miles wide, and beyond stretched mile after mile of our old stamping ground, the Nezperce National Forest, where we had worked as members of the U. S. Geological Survey. Oregon Butte, Buffalo Hump, Gospel Peak, Black Butte, and Nut Basin—all were clearly visible in the clear, cold air. In the west, the jagged Seven Devils Mountains pierced the sky above America's deepest canyon—that of the Snake (see page 95).

From our eminence we could pick out more than a half dozen lookout stations



A DARING YOUNG MAN RIDES A "FLYING TRAPEZE" TO HIS MINING CAMP

Don Smith of the Middle Fork demonstrates the operation of one of the cable cars used in the Salmon River Canyon to transport passengers and goods from bank to bank.

forming part of the marvelous network from which, in the dry summer season, watchful eyes are constantly on guard to spot and quickly report that great destroyer of the forests—fire.

A "GHOST TOWN" RESURRECTED

The strident note of an iron poker beating a steel triangle was our breakfast call on the 17th. Then Briggs and Fritchman appeared in their Forest Service truck, and we were off for Warren.

At Steamboat Creek we saw our first gold dredge, looking like a Mississippi River steamboat lost in the mountains.

Much of the valley has been dug up by these floating monsters, which chew away hunks of landscape and spew out worked-over gravel as they swing back and forth across the flat. In their wake they leave a gleaming, hummocky, and totally barren surface marked by crescentic bowlder ridges that cross and recross the valleys as if raked there by a gigantic comb (p. 131).

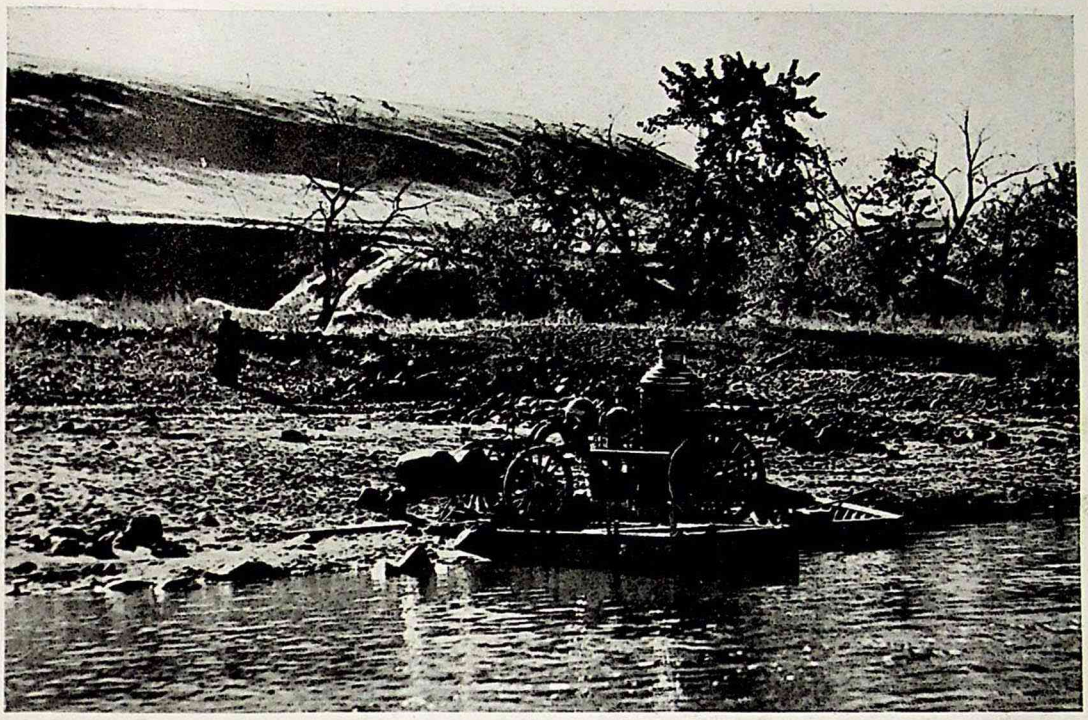
Warren, twice a ghost town, is now in its third period of activity. The depression, $35 gold, and more efficient handling of low-grade gravels have resurrected the once glamorous town (page 125).

Three dredges and a quartz mine are operating 24 hours a day. Prospectors are scouring the hills for likely places to dig from old Mother Earth her well-guarded treasures of precious metals.

Some have set up sluice boxes in valleys already placered two or three times by whites and Chinese and are extracting fair wages from the worked-over ground and the few patches of virgin gravel overlooked by earlier miners.

Here on a steep hillside is all that remains of an old placer ditch, dug for miles with infinite labor and patience, and used to carry water for washing gold from some rushing mountain stream to the diggings.

Occasionally one finds windowless cabins, not much larger than dog houses, once the homes of Chinese miners. Thousands of these orientals, released from the Central Pacific payroll after a golden spike joined



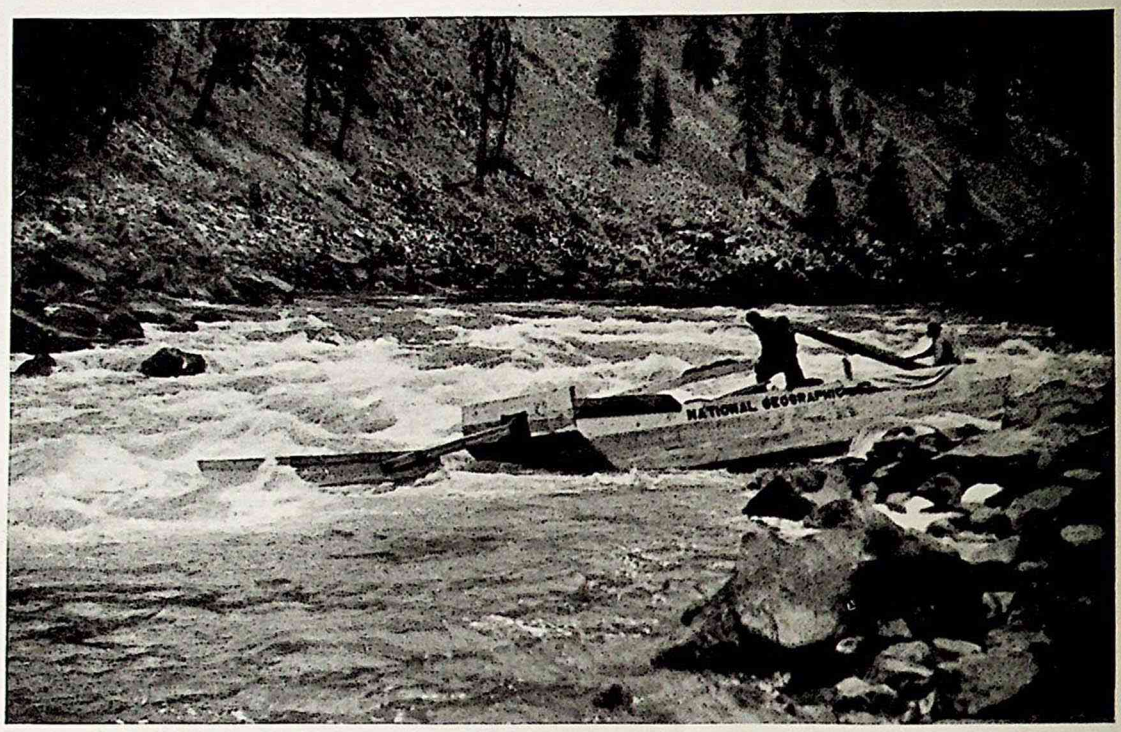
AN OLD CITY FIRE ENGINE PUMPS WATER FOR PLACER MINERS

A few miles below Freedom prospectors work the gravel on the terraces above the river. As the expedition boat passed this old "fire hog" a blast from its proud whistle announced high noon.



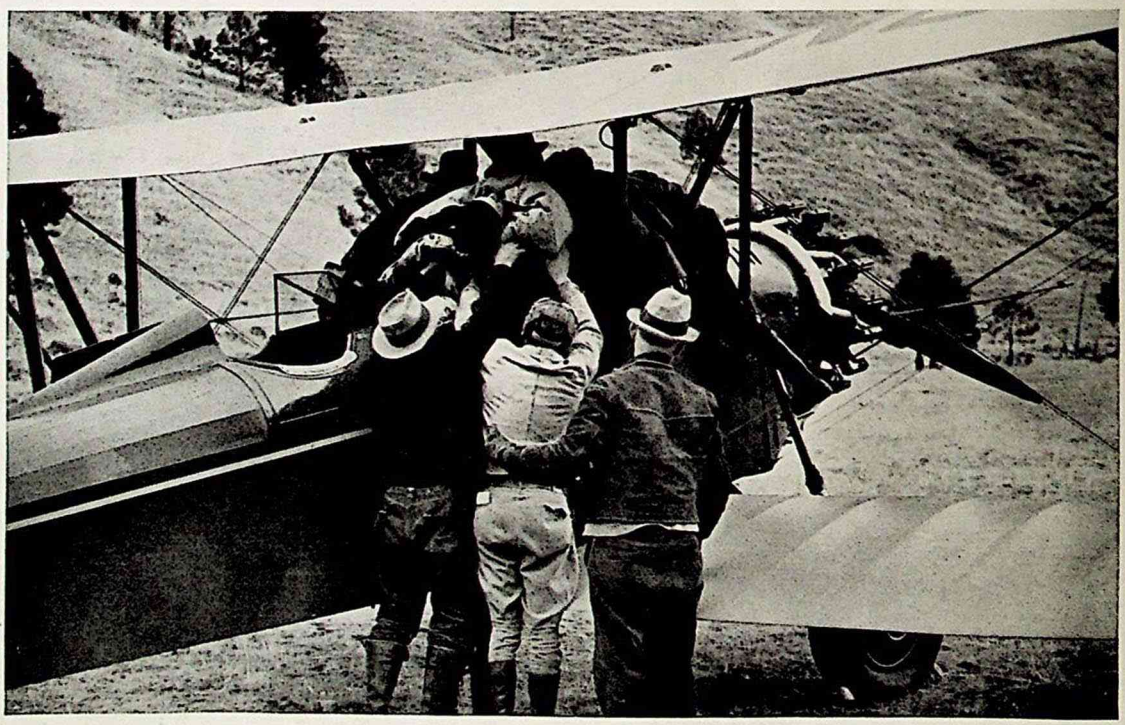
THE SCOW HAD TO BE LIGHTENED BY A TON AND A HALF

The rushing water of the Growler Rapids served only to lodge the boat more firmly on the rocks. In desperation the crew finally unloaded, over an improvised gangplank of pine poles, some of the heavier pieces of freight, such as the radio batteries. The high-riding scow was finally pulled free by means of a lever pole attached to the rope fastened to the bow.



FIVE MILE RAPIDS ALMOST GET THEIR PREY

The bend here is so sharp and the current so swift that the scow was flung up on a shelving rock before it could be brought about. It tipped enough to ship water, but fortunately slid free and continued unharmed. The backbone of the craft is made of green timber and is flexible, so that one corner can tip up at an alarming degree without injury or danger of upsetting.



PILOT DICK JOHNSON FLEW INTO THE CANYON TO RUSH FLINT TO A HOSPITAL

Howard Flint contracted a cold on the trip which aggravated a sinus infection and had to be flown out of the narrow canyon. His parting words to his companions as they put him aboard the plane were: "Well, fellows, if the doc lets me, I'll join you at Riggins." But he never returned (page 118).



MINING CAMPS, LIKE CATS, HAVE MANY LIVES

Warren, a "ghost town," is now experiencing its third boom. A roaring placer camp in the sixties, dead in the seventies, revived in the eighties, dead again in the early 1900's, it is now resurrected in the 1930's (page 122).

that railroad and the Union Pacific on May 10, 1869, swarmed over the mining camps of the Northwest, making a living from ground too lean for the white men.

Copper opium boxes about the size of cigarette packages are still common around these cabins and occasionally flagonlike rice-whisky bottles of pottery are found, some still preserved in the original wicker baskets in which they traveled from China nearly 70 years ago.

Trees more than 50 years old grow in some of the old pits, but it will take a long time for Nature to hide all the ugly scars of the early gold-rush days.

THE MOTOR AGE REACHES THE WILD

Today, Warren, though over 30 miles from a railroad, is booming. Unpainted log and board houses closely line the part of the mountain road that forms the street.

But modern ways of living have intruded even into these mountain fastnesses. Late-model cars line the streets; radio aerials, stretching from pine tree to log cabin, link this outpost with the world's broadcasting stations; a plane zooms down to its field in the meadow.

One dredge, named "Mickey Mouse" by Al Fisher's two-year-old daughter, had just passed through town, turning back yards into rock piles; and "bulldozers" were again leveling off the town lots (page 129).

After an elk steak lunch at the Warren hotel we set out, with the foresters and our Army friends from the French Creek C.C.C. camp, for the South Fork Ranger Station. At Warren Summit, a crudely lettered sign announced that here were to be had guides and horses for hunting parties.

Guides and horses indeed! A few hours ago at Burgdorf we had seen a car sagging under the weight of three fine deer. The driver was complaining that it was no fun, for his party had shot all three from the road and their whole season was over in 20 minutes!

"Couldn't they have held their fire?" asked Williams, himself incapable of doing so with a camera.

Nestled in a scene of grandeur amid high mountains and beside the sparkling stream lies the South Fork Ranger Station—cabin, barn, and warehouse, of which Ranger Briggs and his associates are justly proud.

Several lookout men were here on their

way to the outside after their lonely summer. Bed rolls, saddles, canned goods, lanterns, tents, shovels, and all the other paraphernalia needed for fire control were being checked and stored.

Back at Warren we saw an ancient Chinese gold balance which once belonged to "China Sam."

Warren has not been the same since Sam's death, two years ago. Honest, public-spirited, and industrious, this "heathen Chinee" had the reputation of being Warren's best citizen.

Before rolling down through the night to the French Creek camp, we carried miners' lamps nearly a mile into the Unity Mine at Warren, where a tiny rotary pump kept the drainage of a mountain side from drowning us all like rats in the dark.

Across the river from French Creek nestles the house of Mrs. Standish. It is now barricaded by heavy planks. A rock fully a foot thick had been blasted across the river by the road builders and lay partly embedded in the ground just outside her door.

Her home boasted a lawn, with piped water and a whirling sprinkler. She even showed us a small potted lemon tree grown in that sunny pocket at the bottom of the canyon.

At Howard's ranch our hostess remarked that it was so good to see people after being isolated for many years that she would not have objected had the new road gone right through the "front room."

BY RIVER TO RIGGINS

A mile below Howard's ranch the river narrows to The Crevice between almost perpendicular granite walls several hundred feet high.

The C.C.C. lads had been given a holiday in honor of our voyage, and two truckloads followed, like a regatta cheering section, along the corniche road they had built through this difficult region. As we passed under Manning Bridge, it was lined with smiling, cheering faces and waving arms.

A brisk run through several rapids put us in Riggins about noon on Saturday, October 19.

To most down-river voyagers Riggins is journey's end. Several scows, here broken up after their short but thrilling life of adventure, have been transformed into resthouses for motor travelers.

That night we attended a dance in the schoolhouse. Oxfords, high-heeled cowboy boots, hobnailed high-tops, silk stockings and wool—all were equally at home. People had come for miles, as they do every Saturday night, to this "fifty-gallon" dance. Here were officers and boys from the French Creek camp, the Howards, the Casners from Riggins Hot Springs, "schoolmarms" from White Bird, cowboys, miners, and even grandpa and the babies.

On the morning of the 20th, while we were just below Riggins, a plane droned high overhead, zoomed down upon us, practiced aerial acrobatics between the canyon walls, and went its way. It was the Washington National Guard plane again, with Hartnett and French in to photograph us from the air and deliver to us Spokane Sunday papers before late-rising citizens of that city were out of bed.

Riggins' motorists were out in force, following our progress, or darting ahead to vantage sites overlooking the rapids, here almost devoid of thrills.

From Riggins to White Bird, a distance of 33 miles, the river is paralleled by the Idaho North-South Highway. Throughout this stretch the canyon is generally more open and there are a number of ranches, placer mines, and even two intermediate settlements, Lucile and Freedom.

The surface of the older, more resistant rocks of the mountains was beginning to pass below the younger surface formed of the great plateau flows of lava, and these nearly horizontal flows were now visible, capping the hills high above us.

As we proceeded, the lava became more and more the dominant rock, sometimes forming the whole canyon. But at most places the river has cut through the flows and thus exposed the older rocks below.

THE RIVER MAKES A SUDDEN TURN

At Riggins, after maintaining a westerly course for many miles through the mountains, the river suddenly turns north and flows roughly parallel to the Snake River a few miles to the west. Apparently a block of the earth's crust roughly coextensive with the area between the two great rivers has been uplifted across what otherwise would have been the course of the Salmon, and thus forced the stream to flow north along the "fault zone" for more than 40 miles.

We passed several placer outfits working the bars along the river or the terraces above. New lumber of flumes, sluices,



Photograph by Washington National Guard

C. C. C. BOYS HEWED THIS ROAD FROM THE CANYON WALLS

The route crawls like a snake more than a vertical half mile up the south face of the Salmon River gorge near the mouth of French Creek, the stream at the right (page 118). Rancher York, who farms the small terrace above the creek, is reported to look up his stovepipe in the mornings to see where his horses have strayed during the night!

trestles, and shacks gave visible proof of the recent stimulus to gold mining.

At Freedom our Forest Service friends had left new beds and mattresses for us at a C.C.C. camp, now deserted for others deeper in the hills. At dark, thinly covered bowlders in a small but difficult rapid proved too much for our heavily laden craft and we came to a grinding stop only a few feet from shore. A group of onlookers soon pulled us free, letting go our rope just in time to avoid dragging us upon some new Scylla after we had escaped Charybdis.

While we huddled under our kitchen tent at breakfast the next morning, Forest Supervisor Roy Phillips arrived to escort us over the top to Florence and Adams Ranger Station.

Tire chains enabled us to proceed through a blinding snowstorm to Slate Point Lookout Station, about 6,000 feet above the Salmon. A small herd of cattle, pitiful in the snow, was congregated around the lookout, and inside the cabin we found some cattlemen on their way from the high range down into a more equable climate.

At any season of the year the Florence country has a weird, eerie appearance. It is an extensive flat, bounded abruptly on the south by the Salmon River Canyon, and on the east and west by mountain ridges. Quiet streams meander through

swampy peat bogs screened by symmetrical spruces. The tempo of life is slowed, with a resultant calmness, aided perhaps by the quiet beauty of the enveloping shadowy forest.

At length we reached Jack Hardin's cabin at Florence, and stamped gratefully toward its sheltering warmth to be met, not by jovial prospector Jack and his motherly Scottish wife, but by the comely young daughter of another miner. The Hardins had gone to Lewiston for winter supplies.

On our way to the site of the original town of Florence, we stopped for a moment at the deserted hotel which, with two or three old cabins, still marks the "New Florence" of the naughty nineties.

Of the "Old Florence" of Cherokee Bob nothing remains (page 134). The very ground on which it stood has been sluiced for the gold for which the early comers lived and died.

HARDSHIPS OF EARLY DAYS

The blizzard recalled tales of Florence's terrible first winter of hardship and privation, as told by Bancroft. Discovered accidentally by a party of nine men in September, 1861, the fabulously rich district had, in spite of impending winter, attracted 1,000 miners by November, thus leaving its predecessors, Pierce and Elk City, almost deserted.

That winter the snow was as much as ten feet deep and by January there was nothing to eat for sale in the camp except a little flour at $2 per pound. For weeks men kept body and soul together with bread and snow water, or tea made from fir needles.

Not until May could pack trains get within ten miles of Florence. From there supplies were back-packed at forty cents a pound "and the starving were glad to perform this labor for wages."

We came to the old Florence cemetery, on a few of whose wooden headstones the painted letters rise in relief above the unpainted portions, nibbled away by time.

Here hard-working miners lie side by side with desperadoes, dance hall girls, claim jumpers, and the rest. Slightly deeper pits, now empty, mark the temporary resting places of oriental miners, whose remains have long since been sent back to China.

The low, earth-covered cabin of Albert Adley stands in Pioneer Gulch, once most productive. Adley is successfully "gophering" out small rich stringers exposed in the granite bedrock of old placer diggings. He trundles his rock by wheelbarrow several hundred yards to the creek, where he feeds it by hand through a small home-made mill constructed from an old boiler shell, with a few pieces of discarded steel shafting as a grinding medium.

Within a short distance of Adley's cabin are the new "digs" of Bill Pape, former officer of the Imperial German Navy, who saw service on the Kaiser's yacht before the World War and on a submarine during it.

Before we reached the Adams camp, headquarters of Ranger McConnell, the clouds broke a little and we were able to look out over the country through which we had just come.

We invaded the Adams "hotel," only to acknowledge defeat at the heavily laden table of Mr. and Mrs. John Wilson. Our quarters, that cold night, were in two ancient but still comfortable log cabins.

The road to Freedom led down through the beauty of snow-ermined forest under a sky with touches of blue—winter caught lovingly in the arms of conifers.

A low rock overlooking a flat terrace below Freedom was pointed out to us as the spot from which Chief Joseph harangued his warriors just before the Nez Percé Indian war (page 96). Vic Peterson, of Grangeville, an enthusiastic friend of the expedition, rode with us on the barge, and Al Wagner abandoned car for scow.

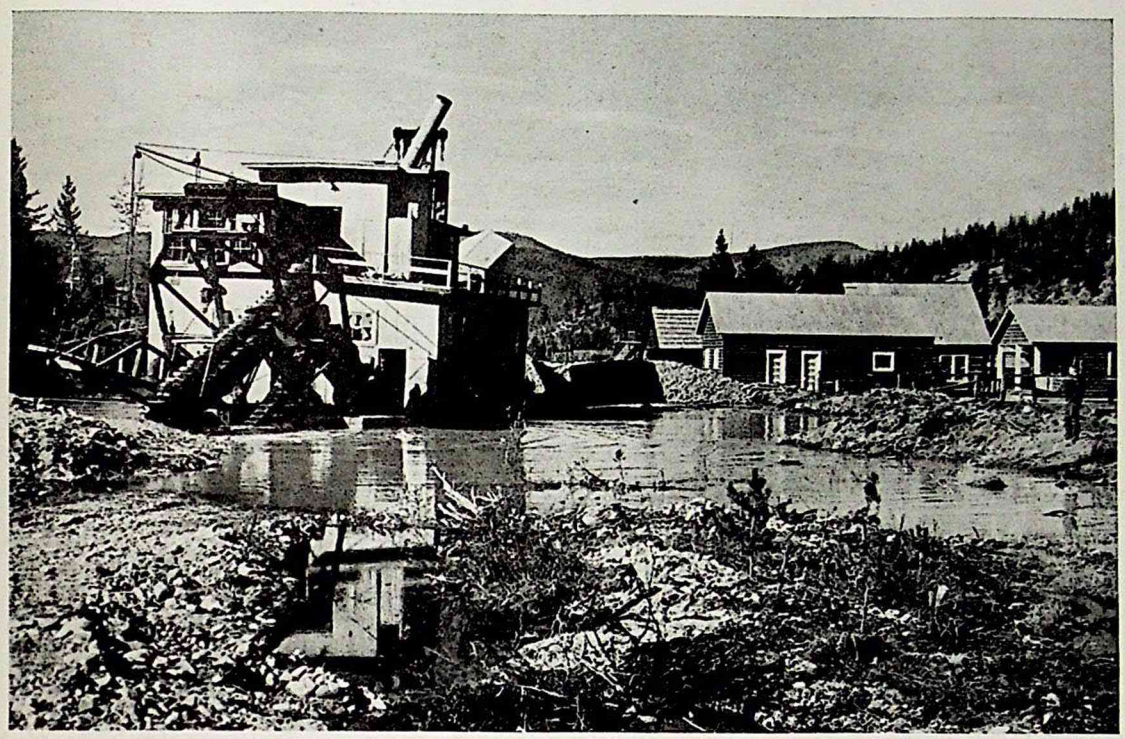
From the mouth of Whitebird Creek we were taken as guests of the Grangeville Commercial Club to Grangeville, where hospitality crowded the best hotel and speeches truthfully began, "Unaccustomed as I am."

A COUNTY LARGER THAN NEW JERSEY

Jack Cunningham thus visited his county seat for the first time. This is easier to understand when one learns that Idaho County not only reaches all the way across the State from the Bitterroots to the Snake, but is more than 1,000 square miles larger than the land surface of New Jersey. For every Idaho County inhabitant the eastern State has 400.

At the scene of the White Bird battle of the Nez Percé war, monuments to both soldiers and braves stand within a mile of each other. The road cuts beds of soft rocks containing the abundant fossil remains of a forest long extinct (page 101).

Below White Bird we entered the little



THE BACK YARDS OF WARREN ARE DEMOLISHED BY "MICKEY MOUSE"

This dredge handles about 3,000 cubic yards of gravel a day. Power for it, the Unity Mine, another dredge, and the town itself, comes from a hydroelectric plant on the South Fork of the Salmon several miles away. The machine is making a good "cleanup" from gravel that lay too low to be worked in the old boom days. At the right are the buildings of the U. S. Forest Service Ranger Station.

known but more thrilling lower canyon. The depth and ruggedness of the gorge have rendered it comparatively inaccessible, although much of the plateau country on top belongs in the famous northwest wheat belt. For the most part, the lower canyon is wider at the top and not so deep as the upper canyon.

A characteristic feature of the lower gorge is its steplike appearance, the result of erosional control by the lava flows, contrasting sharply with the jagged, rounded, or irregular walls and spurs upstream.

A few miles below White Bird the bottom few hundred feet of the canyon walls have been cut in a hard, dense, green rock, called greenstone, underlying the lavas. The greenstone is traversed by several sets of joints and one of them, about parallel to the river, is nearly vertical.

This set makes the lower walls steep and smooth. Although the river is generally narrow, deep, and quiet between them, the rock faces, on which the flood waters had left their record high above our heads, are so precipitous that there were but few places where we could tie up or go ashore.

This stretch, the Green Canyon, is notable for its long, straight reaches of polished water reflecting green cliffs and cloud-studded blue sky.

The Green Canyon ends at Pine Bar Rapids, one of the worst in the river. At the foot of a steep, rocky slope we saw the crumpled body of a cow. High above, others placidly grazed their way around the cliff face.

A PRECARIOUS GANGPLANK

At dusk we approached Rice Creek where a narrow, rough road from Cottonwood bridges the river on its way to the Joseph Plains, between the Salmon and the Snake.

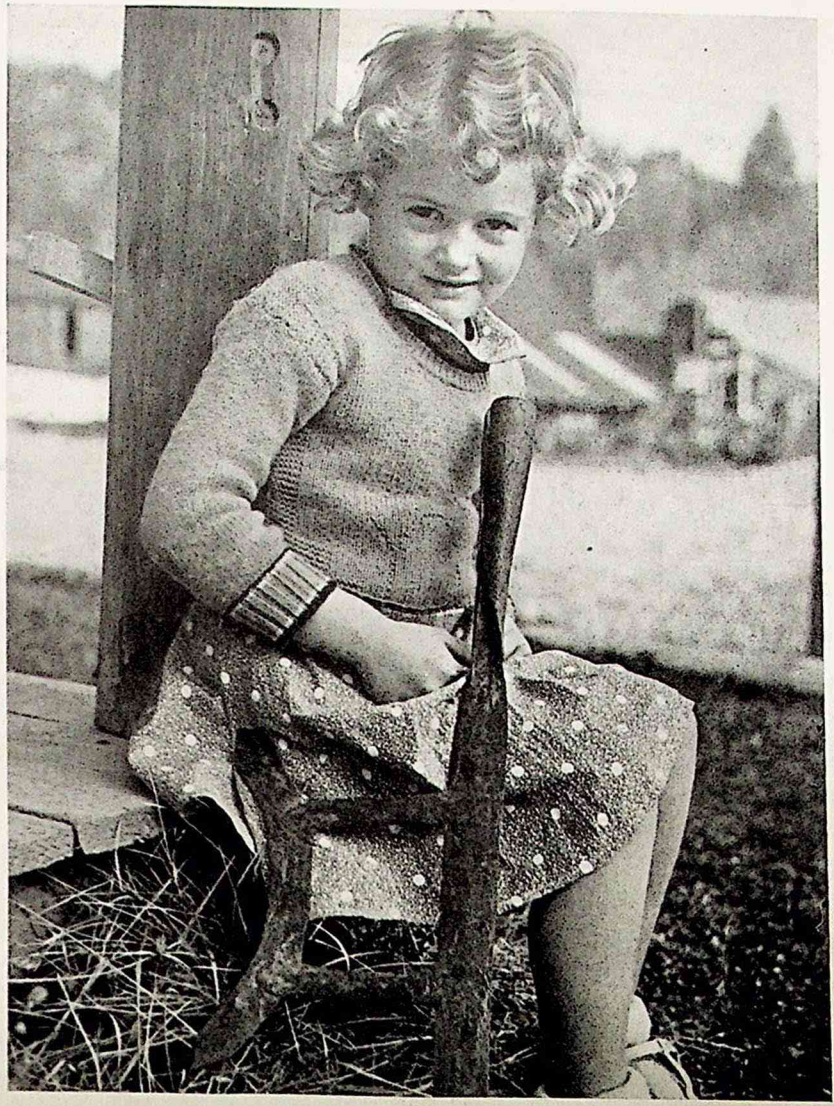
Although we chose the deepest channel, we rode high on a buried rock and stuck. The water was too deep and swift for us to wade to shore. It was too far to jump. Unshipping the rear sweep, we let the rushing current carry one end aground. On this unstable gangplank some of us did a tight-rope walk.

Our old device of the rope and a lever



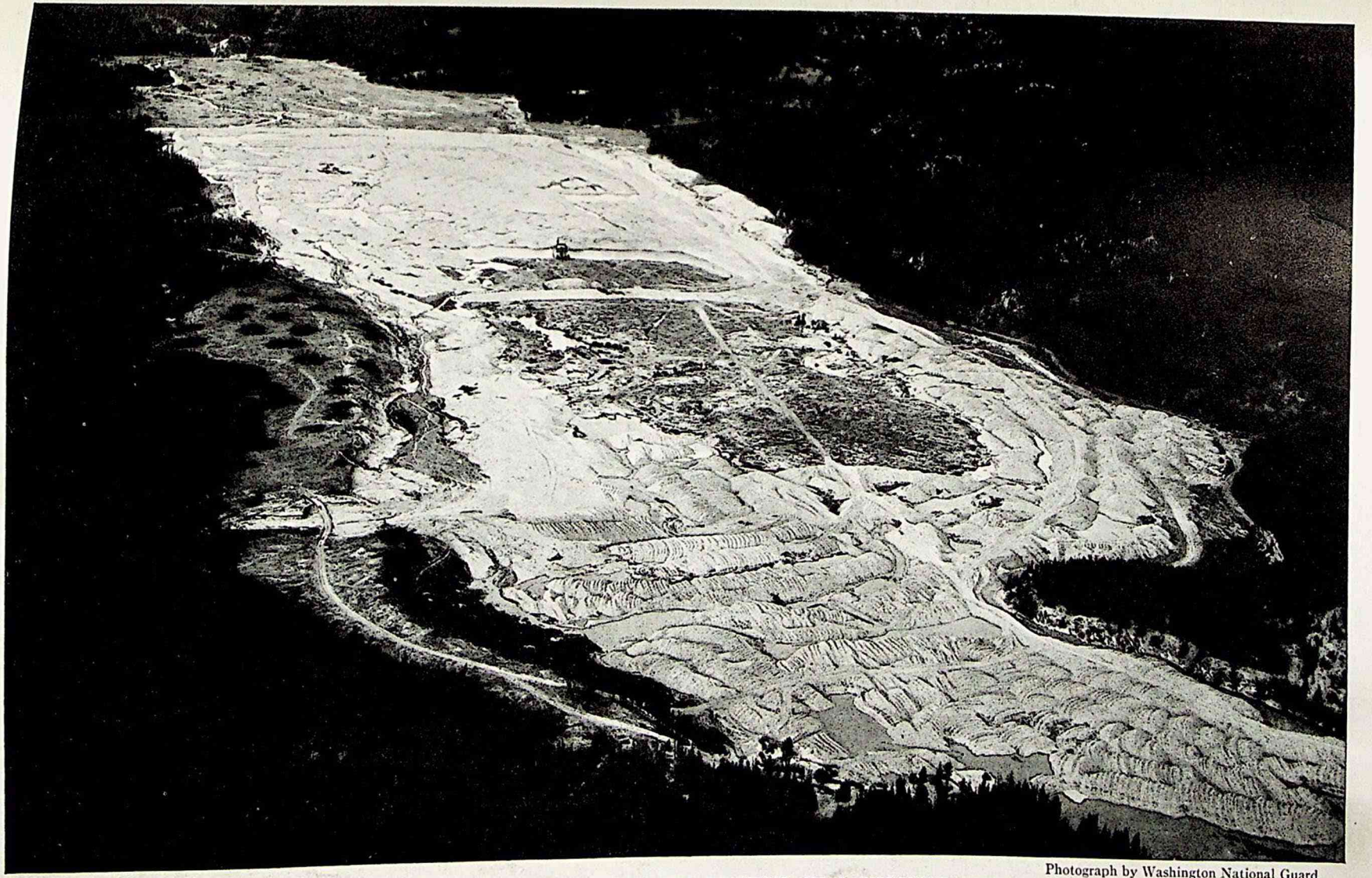
YOUTH FINDS ROMANCE AND REALITY IN GOLD DIGGING

Passing down the Salmon, the expedition met several young placer miners who were trying their luck on the river banks. This couple has stopped prospecting long enough to accompany the *National Geographic Society* from Long Tom Rapids to the mouth of the Middle Fork.



A NEW GENERATION AND A RELIC OF AN OLDER ONE

The dredge "Mickey Mouse" unearthed this beaten-iron pike from tailings left by miners more than 60 years ago. Musket balls and hand-made nails are common. Around Chinese cabin ruins are found rice-whiskey flagons and copper opium boxes (page 125).



Photograph by Washington National Guard

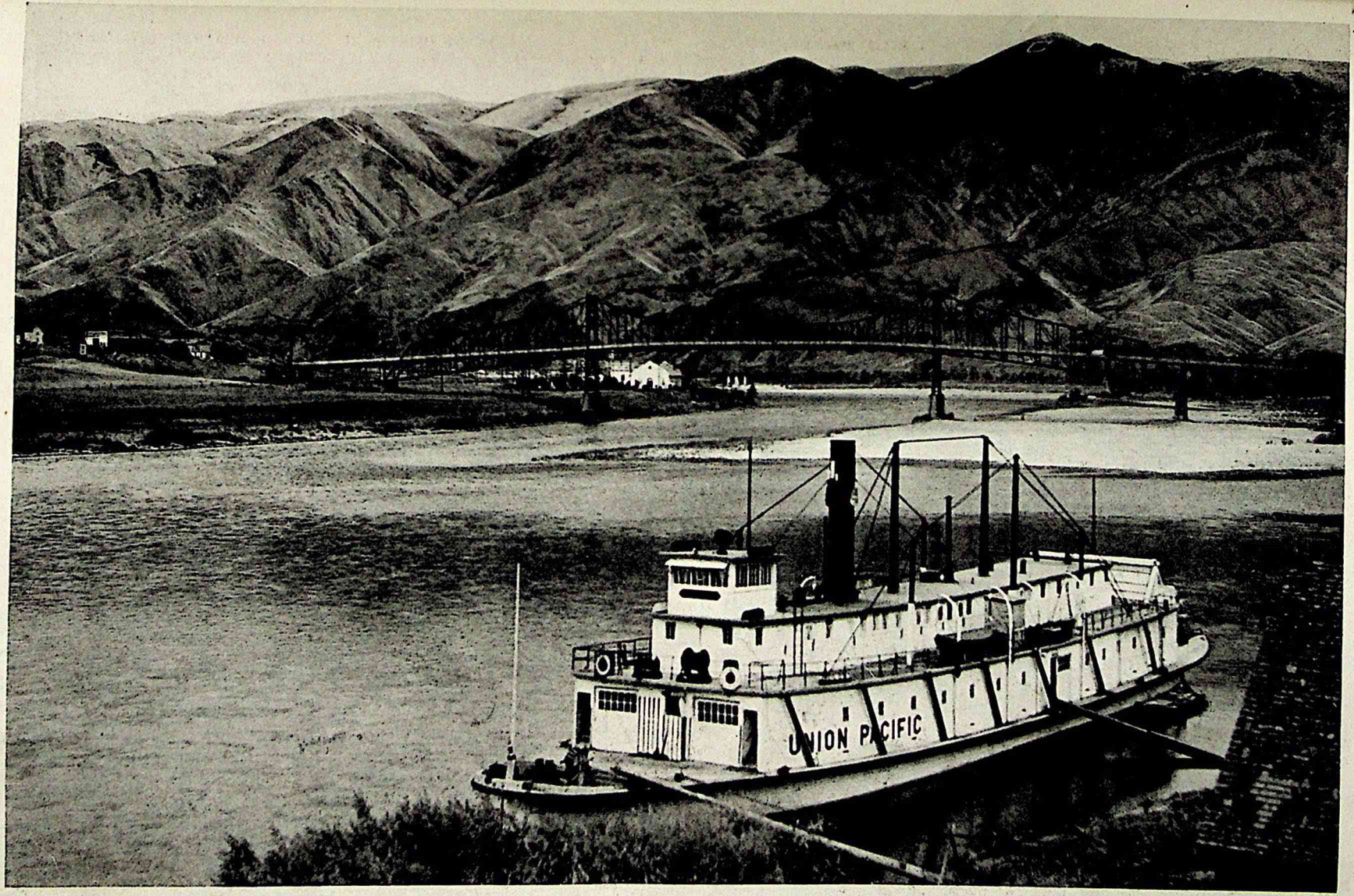
TAILINGS ARE PILED LIKE FANTASTIC FROSTING ON A CHOCOLATE CAKE

In the early placer days miners worked with shovel and sluice box or rocker. Today three huge dredges chew into the valley floors near Warren, spewing out bowlders in uneven windrows. The one operating in the background, after working the ground in the center of the picture, will skirt the side of the basin, mining as it goes, to reach the far end of the valley, now used as an airplane field.



A "DRY RANCHER" FINDS ROOM FOR HIS BUILDINGS ON THE FLAT UPPER SURFACE OF A LANDSLIDE

A few years ago the North-South Highway, from which this view was taken, was displaced about six feet when more than a square mile of earth slid down the slope. Such avalanches are constant hazards to placer and irrigation ditches. The open mesa country beyond is grazing land adjacent to the Nezperce National Forest.



AT "JOURNEY'S END" AN INTERSTATE BRIDGE CONNECTS THE TWIN TOWNS NAMED FOR LEWIS AND CLARK

The steamer *Lewiston* hauls grain on the Snake River to and from the shipping points shared by Lewiston, Idaho, and Clarkston, Washington (left). Here it is moored to the Idaho bank, near where the stream is joined by its tributary, the Clearwater. In 1805 Lewis and Clark reached this river junction. The huge white "C" on the mountain to the right was built of painted rocks by students of Clarkston High School (page 136).



CHEROKEE BOB DIED OF "LEAD POISONING"

His Christian name was Henry Talbotte and he came from Georgia. "Bob" tried to make the local gentry recognize his low-caste "gal" Cynthia, but the resulting quixotic battle ended in his being shot. Even to the placer miner, a burial place is sacred ground. Although this grave is at the head of one of Florence's richest gulches, the soil has not been washed for gold.

pole was without immediate success, principally because we pried loose huge bowlders instead of moving the boat. But after a half hour's labor the boat was again free.

Rice Creek was our first camp without good fresh water, thus marking the transition from the mountains, where clear streams abound, and the more arid plateau country. Below Rice Creek we used boiled river water.

It was late on the 25th before the sun rose high enough to warm the huddled group on the scow and make a camera more than a burden. Our course now lay through lava that extended to the water's edge. Its pillarlike columnar jointing is similar to that of the Giant's Causeway in far-away Ireland. Locally the jointing radiates in huge rosettes as much as 50 feet in diameter.

At the treacherous Snow Hole Rapids, about 63 miles below Riggins, the whole volume of the river is concentrated in a narrow stream that roars and foams between angular blocks of rock rising 20 feet or more above the water. No choice of channels was offered and there was no chance of simply hanging up on rocks until the boat could be pulled free. Obviously we would either rush through without a scratch or the boat would be demolished.

Slowly the scow eased toward the brink, became caught in the now swift but still smooth current, and then was hurled bodily into the churning, foaming wildness of the Snow Hole. Through the spray we could see the sharp edges of the cold, wet rocks as they appeared to grasp for our frail craft, and some missed by inches only. In a few moments it was over and the boat was flung out into a quiet, sunny, foam-flecked pool.

Sixty-eight miles below Riggins, as the low-hanging sun began to throw chill shadows across the stream, we tore through China Rapids, deadly at high water but comparatively easy at this low stage.

Beds were made as Dave started supper, and Captain Hancock soon had a roaring campfire on the beach near Billie Creek. As we gratefully crowded around its warmth we were visited by a local prospector and his wife. The soft-spoken, intelligent conversation of the girl led Williams to ask the name of her college. To our surprise she was not a graduate but, like a majority of



JUST BELOW RIGGINS FRESH NEWS DROPPED FROM THE SKIES

Chard and Shenon became absorbed in the Sunday papers brought by plane from Spokane, while Congressman Clark meditated.

these hardy and independent people, was intensely interested in affairs of State and Nation and extremely well read.

PROSPECTORS INVADE THE BANKS

The number of prospectors along the river had been a never-ending source of surprise to us. We more or less expected them along the bars in the upper canyon, but were not prepared for the tents, sluice boxes, small pumps, tailings piles, and other evidence of their current activity seen every mile or so all the way to the Snake.

With the sun behind us, we started early on the 26th. The current was generally swift, there were many small rapids, and we made good time through a most picturesque part of the canyon.

Occasionally bits of trail could be seen and at one place three youngsters raced us on a galloping horse, finally waving their arms in friendly defeat as they were swallowed in a cloud of dust.

Near the mouth of Flynn Creek greenstone again displaces lava in the lower walls and the sides steepen to form some of the most rugged canyon we had yet seen. This, the much-feared Blue Canyon, extends all the way to Snake River. Since the river had constantly been increasing in volume, we fairly tore through the Blue Canyon.

About noon the high rock wall of the Oregon shore appeared dead ahead and we were whirled out into the Snake, 86½ miles below Riggins and 260 miles from Salmon.

In the narrower places along the Snake we observed high sandbars and huge tree trunks lodged along the cliffs high above the river. These indicate the tremendous seasonal variation caused by increased flow when the snow on the mountains melts.

That evening we camped in Oregon, only 38 miles above Lewiston. We were visited by Mr. J. L. Chapman, who next day showed us some of the many Indian paintings and caves along the Snake River.

The scow cast off early next morning and made no stop until it reached the small store and several cottages that make up Rogersburg, Washington, at the mouth of the Grande Ronde River, on one of whose tributaries gold was found in the fifties.

After a brief tie-up all haste was made to Asotin, only seven miles above Lewiston. Representative Clark had long since developed into a crack oarsman, and in spite of a head wind we put more than 30 miles of river behind us that day.

The next morning a cold wind was blowing. Winter, long at our heels, was ready to empty its snows on our heads. Below Asotin, Hartnett and French dipped their wings in our first welcoming salute.

Soon a huge white "C," built of painted rocks by the students of the Clarkston High School, appeared through the mist, and about ten o'clock we anchored at Lewiston's bathing beach within sight of the interstate bridge that spans the Snake between the twin cities named for Lewis and Clark (page 133).

With mingled regret and anticipation of warm rooms and hot baths, we carried our duffel ashore. A grand trip was over.

SCIENTIFIC SECRETS DISCLOSED

A voyage rich in adventure lay behind us and we had learned much of scientific and economic value. The canyon, cutting deep down into the huge Idaho Batholith, had shown us the inside of this vast granite mass as easily as one might cut a cake to learn what lay under its frosting (p. 105).

Measuring 240 miles by 70, this huge body of granite is one of the largest of its kind in the world. Pushed up as molten rock from deep in the earth many million years ago, it holds important clues to the manner in which valuable minerals are formed.

Contrary to expectations, we found there is no sharp dividing line between the granite mass and the rocks that enclose it. The surrounding rocks were "soaked" with molten granite for a distance of several miles when the batholith first pushed upward into the earth's outer crust, as a pie filling may soak into the enclosing pastry.

Gold is the most important metal found in and near the Idaho Batholith; central Idaho now produces nearly $3,000,000 worth a year. Gold veins are numerous near the top of the granite mass.

We sought to learn whether they penetrate deep into its interior as well. The voyage down the canyon showed us a cross section of the interior. But gold veins along the river were few.

What is the origin of gold and other minerals? Originally, it is believed, they came up toward the surface from deep in the earth in the form of hot solutions, later crystallizing into the ores we know. In parts of the Idaho Batholith streams of molten rock, or "dikes," have pushed up from below into fissures in the hardened granite. The solutions that formed mineral deposits may have come up with the dikes, or soon afterwards.

On the voyage we studied many dikes and from them we learned more of how Nature caches her riches among the rocks.

West of the batholith, the canyon's deep cut showed us the "inside" of another kind of rock mass—lava—one of the largest and thickest lava masses on earth. About thirty million years ago this lava poured out of volcanic vents to cover western Idaho and most of Washington and Oregon east of the Cascade Range. It has formed the rich soil that makes possible the fertile wheat country of the Northwest.

Our voyage helped solve the problem of how the river cut the deep canyon across the grain of the hard masses of the granite batholith and its surrounding rocks. Once central Idaho was a flat surface close to sea level. Quiet streams flowed across it, probably from north to south. Then the plain was tilted toward the northwest and uplifted, and new streams cut energetically into the surface. As the uplift went on, the streams cut deeper, forming canyons. Today the streams are cutting the canyons ever deeper, but they have not cut downward as fast as the country has risen, for the upper river is still several thousand feet above its mouth.

At various heights on the canyon walls are terraces, marking the banks of the Salmon in former days when the uplift halted from time to time. On many of the terraces are old gravel banks laid down by the river in those distant ages, and in many of them gold is found today.

TRUSTY SCOW PRESERVED

Lewiston's hotel was crowded the night we arrived for a dinner given by the Lewiston Chamber of Commerce. The toastmaster, R. G. Bailey, had provided favors with the menu printed on Idaho white pine.

Captain Hancock presented to the State of Idaho the scow that had safely carried us through many hazards. Today it rests on the campus of the State Normal School in Lewiston, a specimen of the strange craft that conquered the Salmon but may soon disappear before the advance of the cross-state motor road. On it, side by side, are the banners of the National Geographic Society and the United States Geological Survey, co-sponsors of our thrilling trip down Idaho's "River of No Return."

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AN AUGUST FIRST IN GRUYÈRES

By Melville Bell Grosvenor

Author of "Color Camera's First Aerial Success," in the National Geographic Magazine

WE ARRIVED in Gruyères at dusk. It was August the First—the Swiss Fourth of July!

Bells began pealing joyously as we climbed the steep path to the town. Something was in the air.

As we listened to the melodious tones we considered how much these bells mean in the lives of the people. They toll for funerals and national tragedies, clang out the time, summon to church, proudly ring out the glad tidings of victory, political or military, and sing hymns and old airs at the whim of the carillonneur. Each call has a distinctive tone. Bells have spoken thus for centuries.

But this excited pæan could mean only that some great event was about to take place. It inspired in us, as we hurried along with the stream of laughing, singing country folk, that same expectant thrill that I had felt as a boy when I chased the whining calliope of the circus parade.

A FIT SETTING FOR AN OPERA

We crowded through the narrow arch of the ancient tower, a frowning pile, gray and forbidding, which once barred the way to the invader (Color Plate I). Now it serves the peaceful purpose of framing the old gate and supporting the arms of Gruyères—a silver crane on a gules shield, surmounted by a crown and held by two semi-naked savages, clubs in hand (page 140).

What a scene burst upon us as we passed out of the entranceway and walked into the town's cobbled court! Throngs of people, dressed in gorgeous Gruyèrien costumes, were gathered in a medieval setting. All seemed exalted, as were we, by the constant dingdong of the scores of bells, some loud and clear, others fainter and farther away, perhaps miles down the valley (Plates VI and XII).

The scene was like an animated amphitheater, in which the central floor formed the arena, and the high gabled houses, with lace-capped heads craning from each Gothic window, made the tiers.

The backdrop was a veritable rainbow of color. Every sill flaunted a box of brilliant geraniums and nasturtiums, making a kaleidoscope of the pastel houses. White-crossed, blood-red flags of Switzerland stretched between the houses and fluttered from poles. Above most doors waved the scarlet flag of Gruyères, with a white crane strutting across its center. Nature, not to be outdone by the efforts of man, tinted the billowing clouds with the rosy glow of an Alpine sunset.

Gradually, we worked our way up the arena, past the central fountain with its washtubs and wooden boards worn smooth with much scrubbing, to the court's upper end. Like a stage before curtain raising, it was the focal point of all eyes.

The peal of the bells ceased, the echoes dying away in the mountains. From afar the faint notes of an approaching band came through the hush. The music was that stirring song, "Le Ranz des Vaches."

Tradition says King Louis XIV forbade his bands to play it, for the lilting tune made his Swiss mercenaries so homesick that they would weep and desert the colors when they heard it. Even today, when a Swiss is far from home, the refrain brings



Photograph by Melville Bell Grosvenor

CLIMB TO THIS LOFTY TERRACE AND ENJOY THE VIEW OF CHÂTEAU, CHURCH, AND MOUNTAINS

From here on the night of August 1 the surrounding hills sparkle with bonfires lit by herders (page 141). Covered with ivy is the Château's "Tower of Torture," now an arms museum, where tattered flags captured by the Gruyèriens at the Battle of Morat are preserved. Strangely, the name of this dairying district in Fribourg Canton is spelled Gruyère, while its ancient capital adds an "s," making Gruyères.

tears to his eyes. It produces that same tingling along the spine that a United States Naval Academy man feels when "Anchors Aweigh" is played.

PARADE OF THE COSTUMED DOLLS

Soon we saw emerging from beneath the arch a file of tots, gay in Gruyèrien costumes. At once a chatter began in the audience, as mothers and fathers recognized their offspring. A vivacious little bride and handsome young bridegroom led the parade. So small and neat did they seem that they might have been animated dolls paddling along—a Swiss edition of the Chauve Souris (page 142).

Each "doll" looked searchingly at the spectators. Every now and then one broke into a blushing smile and shyly turned away; perhaps a parent had been glimpsed in the throng.

The happy children passed on, the eldest and tallest bringing up the rear. Arranged in steps, they resembled a bright-hued escalator moving down the path.

The men of the village and near-by dairy farms, young blades and gray-bearded sires, followed the children, solemn and in step, mindful, perhaps, of their many months of military service. They wore traditional dark-blue jackets with short, puffed-out sleeves, white shirts clean as new snow, and tiny skullcaps like those of college freshmen, only made of straw (Plates I and IV).

Some of these men had come down from the high pastures to attend the fete. Each had his inevitable pipe, huge and cumbersome, with a lid to keep the sparks from flying on a windy day.

Behind their lords cheerfully marched the maids and matrons, full-scale models of the infants. Broad-brimmed hats with black velvet streamers set off the good looks of these blond Swiss demoiselles and their brilliant dresses.

I turned to my Swiss cousin, who had brought us here to his favorite village and knows his native land like a book. "Lilo, I always understood that costumes were



Photograph by Melville Bell Grosvenor

AS THE SUN SETS, A BOY AND HIS SAINT BERNARD TROT WITH THE MILK TO THE CHEESE FACTORY

Chief traffic hazard on many of Switzerland's excellent highways are dog-drawn carts, used mainly for hauling dairy products (Plate X). This magnificent animal pulls his cart so fast that the boy seems to be holding back, rather than assisting. Paced by the author's automobile on a level stretch, the team jogged along steadily at about five or six miles an hour (page 155).

never worn any more in Switzerland. You see them only in picture postcards—models dressed up in museum clothes and posing for the photographers!"

"Oh, no," he said, "the people of Gruyère take pride in their costumes and cling to them. Once the garments were practically abandoned, but patriotic societies for preserving costumes delved into records and drawings of early days and these are the treasure-trove. *They are* Gruyère.

"Women don the bright dresses only on fete days, but the men wear theirs daily, even when herding cattle in the high pastures or making that famous cheese—which we really came here to see, you know."

EVEN FIREWORKS!

The joyous parade meanwhile circled the fountain and came back up the street, children toddling, their fathers and brothers still stern and solemn in military formation.

It was to the village shrine beneath an overhanging eave that the procession wound. Here they gathered, young and old, in a circle and sang the chorals and rollicking folk ballads, as their forefathers had before them (Color Plate III).

Suddenly, as the last note of the last song died away, a terrific bang was heard far down the court. All eyes turned, to see a rocket bursting in the air, the sparks falling into the gay crowd. This was the signal the youngsters had been awaiting. Forgetting their lace and silk costumes, they rushed pell-mell toward the man with the fireworks.

Soon all were swinging sparklers, Roman candles, and red flares to make a fantastic sight in that ancient courtyard. Arched windows, gilded coats of arms hanging from house fronts, and bright flags stood out brilliantly in the glaring light.

If some old man-at-arms had come to life and poked his head out of a window, the ghostly scene and popping din might have made him think the Count's army was defending the town from a night attack.

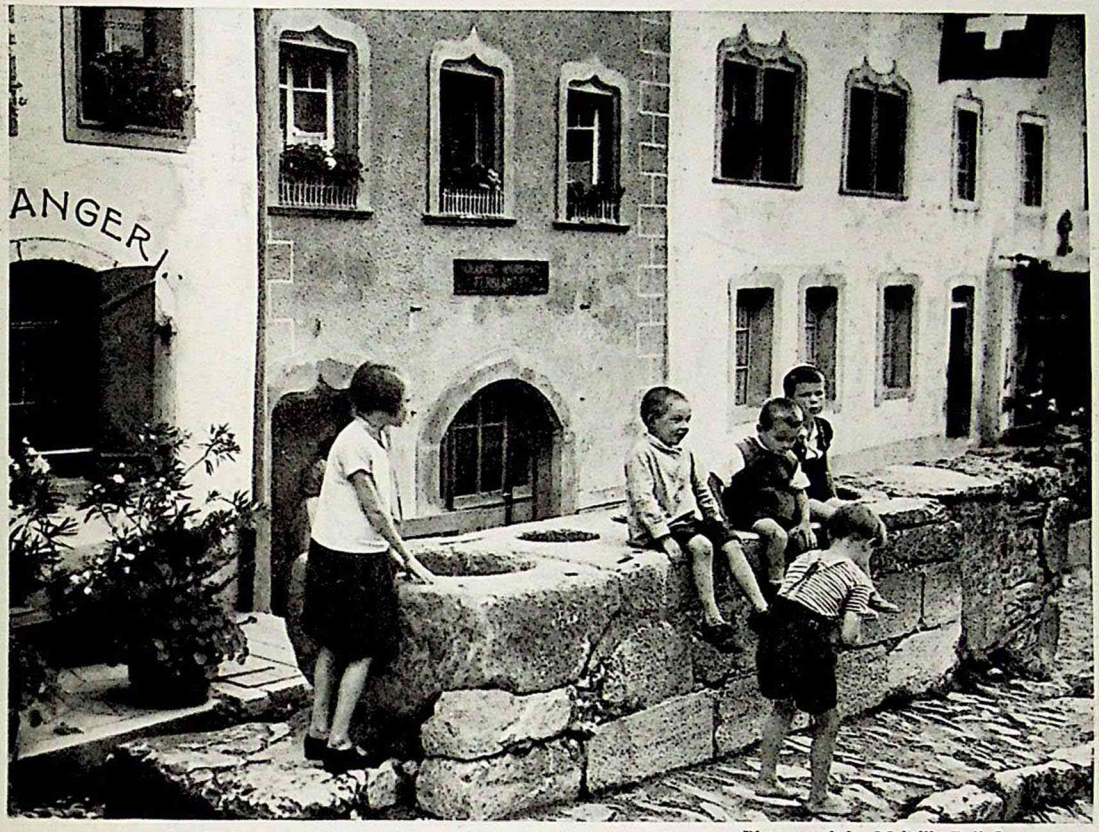
Was this Switzerland? That staid land of snow-capped mountains and winter



Photograph by Melville Bell Grosvenor

TWO SEMI-NAKED BARBARIANS, CLUBS IN HAND, NOW ARE THE ONLY SENTRIES AT GRUYÈRES' ANCIENT GATEWAY

Once the arched portal was heavily fortified. It fronts on a terrace to which two sloping paths lead up from the valley (Color Plate XV). Twin towers, pepperbox style, guard the corners. Beyond the arch is the central court upon which the houses face.



Photograph by Melville Bell Grosvenor

NO CHANCE OF BEING GIVEN SHORT MEASURE HERE

Wheat was poured into the basins of various sizes carved out of the stone block. When full, they were emptied by pulling plugs from holes in the far side. Now the measure is preserved as a curiosity. Children use it as a play-place, the tiniest curling up in its largest openings in the game of hide-and-seek.

sports, where folk never wear costumes or perform the old dances? Even Lilo was spellbound. He had never before been in Gruyères on the night of August the First!

A whirling cartwheel, on a post above the fountain, was the mad climax to the fireworks spectacle. While a sea of shouting, happy youngsters watched, a daredevil climbed up gingerly and stole the still red-hot frame as a souvenir.

We went into the hostelry for dinner. Entering, we passed the large kitchen with cooks and kitchen maids scurrying around with their array of shining copper pots and pans. The delicious aromas that came from that spotless kitchen were a tantalizing appetizer.

Our charming hostess, matronly in her colorful costume with a dainty Swiss lace shawl thrown over her shoulders, insisted that we come out on her terrace for a moment. We went rather reluctantly, for it was nine o'clock and we were hungry.

We were astounded by the view, as we stepped out onto the gravelly balcony, perched on the brink of a precipice. A ring of jeweled lights, sparkling from the mountains, encircled us (page 138).

ALPINE BONFIRES RIVAL THE STARS

"What are they?" we asked our hostess.

"Huge bonfires built by the herdsmen to celebrate August the First."

"You mean all of those twinkling lights, some down low in the valley and others high on the mountains, are specially built fires? What for?"

"Originally the Swiss used bonfires as a sort of medieval wireless to pass news of a victory quickly from one village to the next. Now they celebrate great events in their history, especially battles and alliances, by building the fires on anniversary days," Mademoiselle Ruffieu explained.

"On August 1, 1291, three communities of Uri, Schwyz, and Unterwalden formed a



Photograph by Morel

ALL DRESSED UP AND READY FOR THE PARADE

These youngsters led the August 1 procession of costumed villagers and herders (page 138). The girl, wearing a broad-brimmed hat with black velvet streamers, is a miniature of her elder sisters and mother. A gray top hat supplants the usual straw skullcap for the boy, but he carries a herder's cane.

perpetual alliance to protect themselves against bullying neighbors. That was the beginning of the Swiss Confederation, our 'Declaration of Independence.' Now each year we keep alive the memory of that great day by a fete, the ringing of bells and the crackling of bonfires.

"You see that tiny light up there? It's not a star. Some alpinist has climbed the rocky crest of Dent de Broc, 6,010 feet, and lit that fire (Plate XV). He had to carry every bit of wood up from the timber line. Climbing down in the dark will be no joke, either, if he wishes to descend before dawn."

When we had fully viewed this dazzling sight, she guided us back to her cozy dining room. "Do you mind eating at this little table in the corner, messieurs et mesdames? The Choral Society is to meet here tonight and I have reserved these big tables for them."

"No, indeed, mademoiselle. All we want is dinner. We are hungry!" A banquet was put before us, but the steaming vegetable soup was enjoyed most. Lilo was looking forward impatiently to the last course, because instead of a "sweet," native cheese—Gruyère — was to be served, and it was a favorite with him.

While I was enjoying a savory bit of chicken, I heard a familiar song in the distance. Turning to my wife, I said, "Did you hear that?"

"Yes, it's 'Frère Jacques.' "

We peered out of the window. Leaning far out over the geranium box, we saw below us a ring of dancing, singing children (Color Plate VI).

"Frère Jacques! Frère Jacques!
Dormez-vous? Dormez-vous?
Sonnez les matinés! Sonnez les matinés!
Dig, ding, don! Dig, ding, don!"

Over and over they sang it, whirling and skipping the while. So, we thought, even the youngsters are conscious of the rôle the silver-toned bells play in their lives.

The song happens to be a favorite with our children, who learned it in French class at school. All last winter they sang it repeatedly until we forbade the song in the house! It was thrilling to hear it sung by these French-Swiss youngsters in that



Photograph by Melville Bell Grosvenor

WHEN VILLAGERS DON THEIR COSTUMES AND FEAST AND SING ON AUGUST THE FIRST, GRUYÈRES RECAPTURES ITS LONG PAST GLORY

Bright Swiss flags, blood red with white crosses, and scarlet banners flaunting rampant silver cranes fly from every house front on this important day. When the weather is fair, guests of the pleasant Hotel Fleur de Lys eat their meals at the white tables (background) or on the terrace in the rear of the buildings, overlooking the valleys and the mountains that surround the hilltop town.

paved street, lit by the fitful light of open doors and windows.

We listened and watched for a quarter of an hour, while our chicken grew cold on the table, to this and many other native refrains and dances. Finally, to our delight and the surprise of my cousin, the childlike voices broke into "Auld Lang Syne." Soon thereafter the youngsters scurried to their beds and the audience of parents and villagers dispersed. The court was empty in a few minutes, and only the sound of singing in various taverns broke the peace.

CHORAL SOCIETY PROVIDES DINNER MUSIC

As we ate the tasty cheese—it seemed more delicious here in its native haunt than anywhere else—groups of young women and men began filing in with their songbooks. The room filled rapidly.

Some of the girls soon grew weary of their tight black-lace caps or wide-brimmed bonnets and took them off. Luckily, the end of our table became the depository for these bonnets. Each girl, as she laid hers down, gave us a smile.

Then, under the leadership of a vivacious matron, they sang together, full-throatedly, their old ballads (Plate V).

When the singing was over and the young people had gone to their homes, the landlady escorted us to our rooms. We were disappointed, for they faced the court, and we could not see from aerie windows the mountains and the still-glowing bonfires.

The good lady was surprised, for not often does she have such requests for outside rooms. Most guests prefer the ringside seats which court windows provide, as we soon found out.

Our low-ceilinged chamber was a delight. It was large, and, of course, as neat as a pin. In one corner stood a blue, glazed-tiled stove which, in the cold winter days, served to warm the room (Plate XIII). White beds, placed close to the heater, suggested puppies snuggling up to their mother on a frosty night.

On each bed lay a mountainous white quilt, fully 15 inches thick. While this covering looked heavy, actually it was light and fluffy, for it was stuffed with duck or goose feathers and down.

Furniture was plain, but comfortable, and the wide white boards of the floor creaked as we walked across the room.

Shortly after we had climbed into our feather beds, the boys in the tavern next door became boisterous. From snatches of the gay speeches and songs, we learned that some of the party were Gruyèriens who had come all the way from Spain to be home on the day and night of August the First! (Plate IV).

They sang the songs of their boyhood, but repeatedly broke in with "Le Ranz des Vaches." Over and over again they sang this haunting refrain. Here truly was a 20th-century example of the magnetic power of the old piece. The singing of the song in far-off Granada may have drawn these native sons home again.

Far into the wee hours, until three a.m., the revelers sang. Then they poured out into the court, laughing, talking, and shaking hands in adieu.

A TOUCHING FAREWELL

"One last song," they shouted to two handsome young herders, who, wearing traditional dark-blue costumes, stood together, arm in arm, and sang the eerie "Au Clair de la Lune" (In the Moonlight). Around the court, heads poked out of windows to watch this farewell, but no one complained of the noise!

As the song ended, the group began "Le Ranz des Vaches" again and the automobile pulled away with the harmony in full sway. We could hear the voices growing fainter as the car passed out of range down the hill. The stay-at-homes in the court finished the ballad alone, and then turned on their heels and were gone.

In the morning we wandered up the court toward the Château. Girls and women were already scrubbing clothes at the fountain and in the covered washing place set aside for the purpose.

Three boys were rambling over the stone grain measures at the side of the street (page 141). They took delight in casting pebbles into the holes on top, where the wheat used to be poured in, and watching them come tumbling out the exit holes at the side. Stoppers still dangled by rusty chains from some of the spouts.

We wandered through the old Château, turreted and forlorn, which crowns the high side of the town's lofty perch (Color Plate IX). Here the Counts of Gruyère held sway over the fertile Sarine Valley for nearly five hundred years.

In the middle of the 16th century, the last Count became involved financially,

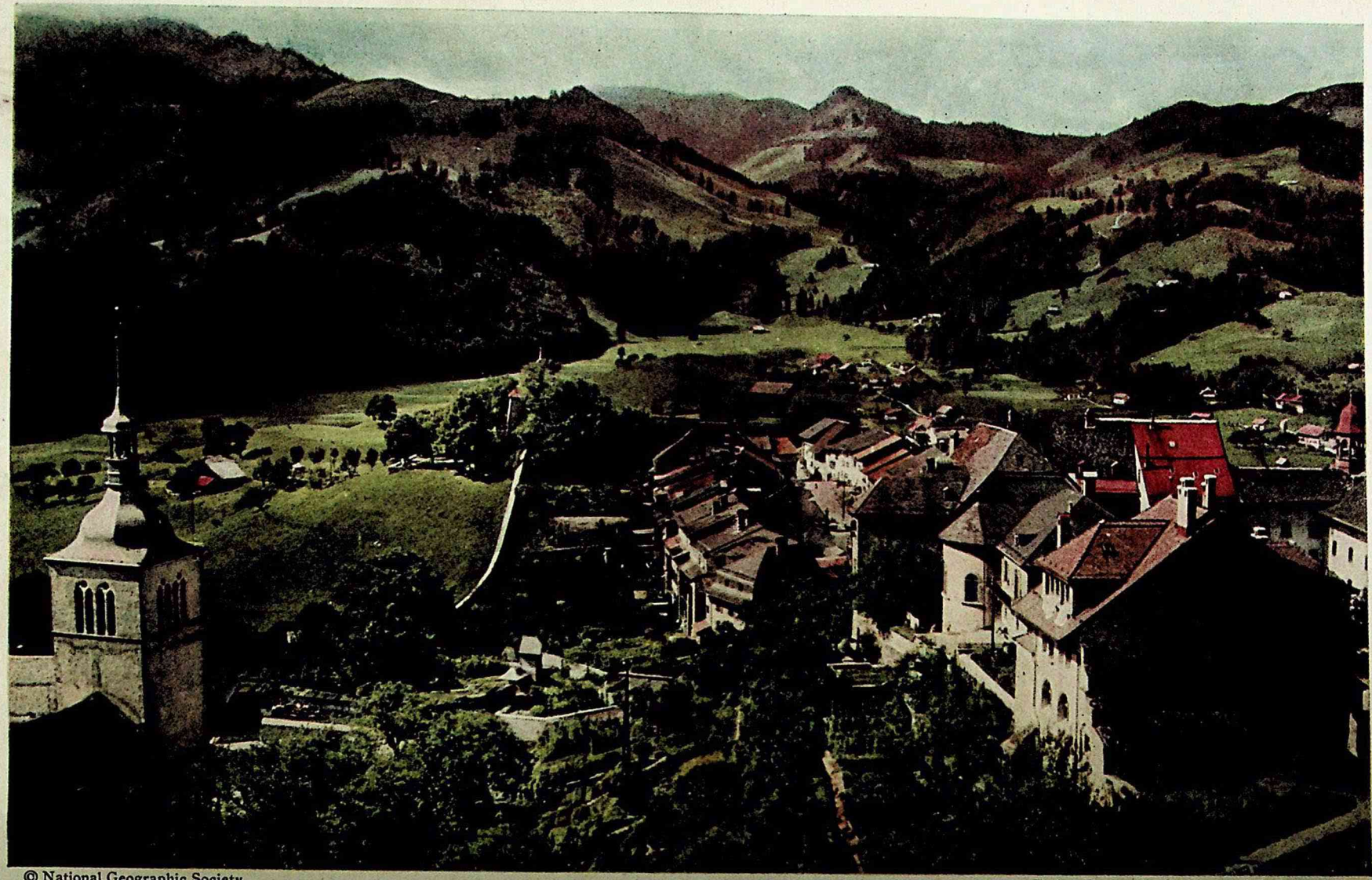


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Finlay Photograph by Bernard F. Rogers, Jr.

GRUYÈRIENS, OLD AND YOUNG, GATHER BY THE ENTRANCE FOR THE AUGUST 1 FETE

Each summer they celebrate the founding of the Swiss Confederation, when three communities united more than six centuries ago. In the old hill town of Gruyères, set apart from the busy life of today, the happy herdsmen and their costumed families meet in a medieval setting. All men, from boy to grandfather, wear the round straw caps, like freshmen's hats. Now only foot visitors climb this steep path, because wheeled traffic uses the new road cut through on the other side of the town. Above tower the tall houses which in olden times served as protecting walls as well as domiciles.



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Finlay Photograph by Bernard F. Rogers, Jr.

FROM THE CHÂTEAU ARCHERS COULD COMMAND THE VILLAGE'S ONLY STREET AND THE FERTILE VALLEY LYING BELOW

Small vineyards and gardens now cover the slopes where the knights used to joust and practice at war. In the right center, between the houses, is the courtyard, center of life in Gruyères, where the festival is held. Chalets of herders dot the surrounding hillsides.



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Finlay Photograph by Bernard F. Rogers, Jr.

CLIMAX OF THE AUGUST FETE IS THE SINGING OF CAROLS AND OLD-TIME BALLADS AROUND THE VILLAGE SHRINE

While the festival usually is held at dusk, last year the Choral Society courteously met on another day so that these natural-color photographs could be made in brilliant sunlight. Every housewife takes pride in the flower boxes which brighten her home. A covered water trough behind the spectators (left) provides the tubs for the town's "hand laundry" and the road passing it leads to the Château whence the procession started.



"GOOD LUCK BE YOURS, RICH CHEESE AND BREAD—HA! HA! LIOBA"

So sing and shout the herders in their French dialect. In medieval days, when Swiss serving in foreign armies heard this ballad, "Le Ranz des Vaches," they became homesick and sometimes deserted. Many versions of the song to the cows have been handed down through the generations.



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Finlay Photographs by Bernard F. Rogers, Jr.

IN THE BANQUET HALL THE COUNT OF GRUYÈRE DINED HIS GAY COURT

Painted on the walls are scenes famous in Swiss history. In the central panel a feast is being held in this room in the Château, with the fireplace and coat of arms depicted as they still appear (right).



WHILE THE HERDERS SING IN TAVERNS, THE CHORAL SOCIETY CHANTS IN THE HOTEL

Dressed in the silks and satins of the Gruyère costume, these French Swiss keep alive the traditional songs of their forbears of love, war, and the lowing herds. To enter this dining room of the Fleur de Lys, one must pass by the kitchen, and the pleasant aromas from steaming pots serve as appetizers.



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KNIGHTS OF OLD WERE FEASTED FROM SUCH FIREPLACES

Now no longer in use, this kitchen in an annex of the Fleur de Lys Hotel serves as a museum. The proprietress lights a fire beneath the soup kettle, and the cat, its bed too warm, jumps down.



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Finlay Photograph by Bernard F. Rogers, Jr.

TODAY CHILDREN DANCE AND SING IN THE OLD COURTYARD TO ENTERTAIN PARENTS; NOT, AS FORMERLY, TO CELEBRATE A BATTLE

Gruyèriens have always loved to feast and dance. In the days of chivalry it was to welcome home the knights of the castle when a victory had been won. The town is a center for a dairying district and the herders, who still cling to their traditional costume, frequent the one street, which is this *court. Old French* songs are favorites with the youngsters.



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"NOW I LAY ME DOWN TO SLEEP" IN A FEATHER BED

This youngster climbs under one of the thick comforters found in the bedrooms of the older houses. Often the fluffy coverings seem mountain high, but they are light and warm.



Finlay Photographs by Bernard F. Rogers, Jr.

HERDERS OF TOMORROW STOP FOR A DRINK

Water, fed from a spring, spouts into the trough hewn from a log, like an Indian dugout canoe. Cheese is stored in the cool, dark basement at the left, while the family lives above.



Finlay Photograph by Bernard F. Rogers, Jr.

HERE LIVED CHALAMALA, FAMOUS JESTER TO THE COURT OF GRUYÈRE

This kitchen, completely furnished with copper pots and pans, now serves as a museum of home life during the MiddleAges. Chalamala had a ready wit and his advice on state affairs was always sought.



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Autochrome Lumière by Bernard F. Rogers, Jr.

THEIR FORBEARS FOUGHT VALIANTLY IN THE CRUSADES

Gruyèriens are as proud today of their independence as they formerly were loyal to the Counts. Hanging in the window are wooden spoons with which one partakes of Gruyère's famous thick cream.

with the result that Fribourg swallowed part of his lands and Bern took the rest. Gruyère is still an integral part of the Canton of Fribourg, but bustling Bulle near by is now the capital of the district, politically and commercially.

We left Gruyères in the forenoon, planning to visit some of the famous "two-family" homes and villages around Romont and Fribourg.

Driving along the fine roads of Gruyère, smooth as a billiard table, we passed many little hamlets of several farmhouses grouped together.

It was quite evident that we had come in the midst of the manuring season, that time of the year when rich fertilizer is spread over the fields. In the front yard of nearly every house there was a pile of fine brown compost, stacked in neat square heaps.

As we passed one particularly large, rectangular mound, Lilo shouted from the rumble seat, "That farmer is wealthy."

"How's that?"

"Well, he has a huge pile of manure, larger than any of his neighbors, and, you know, in these parts that is a sign of wealth. The larger the pile, the bigger the herd of cattle, and, of course, the more cheese from the milk, the richer you are!"

Some of the homes of the dairymen serve a double purpose. One half or end is devoted to livestock and the equipment pertaining to the animals, while the other houses the owner and his family. Huge overhanging eaves, sometimes projecting as much as 10 or 15 feet from the walls, protect the homes from driving rain and the heavy snowfalls and drifts of winter.

FAMILY AND CATTLE SHARE SAME ROOF

The family's end of the house is so charming that it seems to offset the unsightliness of the "built-in" barn.

A well-kept garden, bright with nodding hollyhocks, nasturtiums, geraniums, and other familiar flowers, smiles behind the neat fence. Each window of the three- or four-storied house is framed by a box of geraniums, with scarlet and orange blossoms, and bright-green shutters which set off the white front. Everything appears orderly and clean—a Swiss characteristic.

Let the eye wander slightly to the right or left of the home, and behold the barn, all under the same roof. A horse or ox is tethered at the corner, a big two-wheeled cart leans against the wall, and chickens are always clucking and scurrying in and out of the door.

Looking through the large opening, one sees the barn yawning like a huge cavern. High up is the hayloft, as in most other barns the world over. To the right or left of the entrance are the covered stalls, which, though empty now, house in winter the owner's income producer, the dairy herd.

Some chalets have as many as four or five floors, but these are mostly country inns found in the higher villages. Styles in architecture vary widely, but the "two-family" type seemed to be the popular farmhouse in this vicinity.

Floors of the home are made of boards as wide as 18 or 20 inches, worn creamy white from constant scrubbing. Ceilings are low and, of course, partitions are natural wood, unvarnished and unpainted. In the better-class homes, the walls are richly paneled.

We drew up in front of one attractive chalet. The housewife was standing in the doorway holding a pink-cheeked cherub. My cousin, knowing that I had been longing to inspect such a home, ventured up to the lady, and in a few minutes we had a smiling invitation to enter.

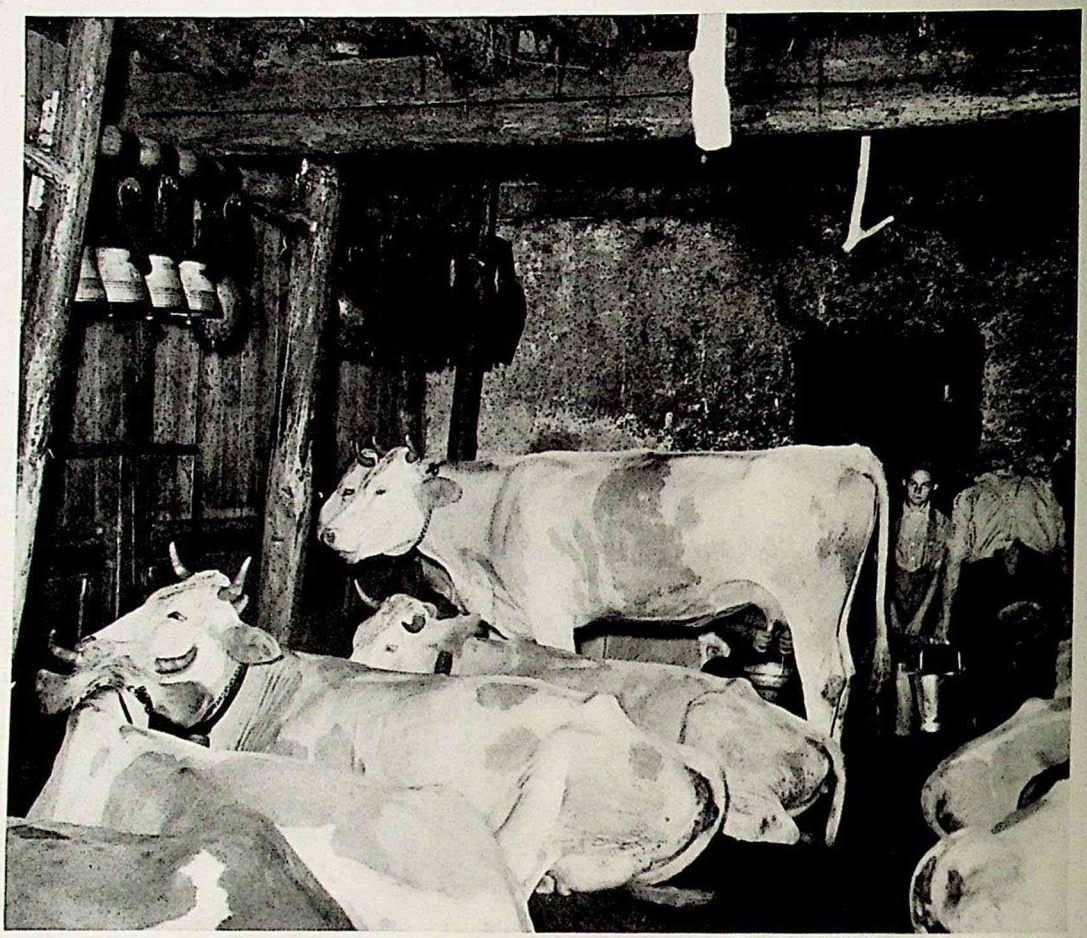
THE KITCHEN SERVES FOR MANY PURPOSES

Opening the gate, we crossed the garden and walked through the door. To our surprise, we entered the kitchen, or rather the dining room, kitchen, and living room combined in one.

Our hostess pointed out the objects so familiar to her. On the right as we entered was the simple long table with narrow benches drawn up on each side. Of course, a tiny bunch of flowers from the garden graced the center, giving a touch of color to the bare room.

Continuing around the kitchen, she showed us the huge copper cheese boiler, hanging from a hook over the hearth, and the wide chimney at the top which draws off the smoke when fires are lit beneath the kettle. Other pots and pans for cooking were placed neatly on hooks.

On the other side of the room was a cupboard where were kept wooden milk buckets and other dairy implements. We were impressed particularly by the clean-



Photograph by Bernard F. Rogers, Jr.

MILKING TIME IN A COW SHED HIGH IN THE JURA MOUNTAINS

A herder, with a single-legged milking stool fastened to him, carries a full bucket into the adjoining cheese room, while another milks. All cows wear bells which acquaint the keeper with their location and perhaps direct the strays to rejoin the grazing herd. "Queens," or herd leaders, are cows which have a knack for leading the other animals back to the milking spot or guiding them to the foraging grounds. They carry the largest bells, sometimes two or three hundred years old and quite musical in tone. Several hang on the wall.

liness of this room, about which the daily life of the family revolves.

A door led off to a large bedroom with big wooden beds against the wall and under the windows. Next to this was a smaller one, reserved for the owner and his wife.

A BALCONY FOR A BREAKFAST NOOK

In a corner of the larger room was a masonry stove, resembling the one in our inn at Gruyères. It was fired from the other side of the wall in the kitchen. On cold days in winter the children sometimes hide away on top of the stove or behind it to keep warm (Color Plate XIII).

We climbed the narrow stairway from the kitchen to the second floor bedrooms.

Our hostess led us out onto her wide balcony overlooking the garden. Outside the rail a flower box was aflame with bright blossoms. "On warm days we dine out here," she told us.

"Your balcony must be cozy in all weather," my cousin suggested, noting the overhanging roof.

"Yes, monsieur, in summer the gable acts as an awning to ward off the hot sun or driving rain. In winter it is a double blessing, for it permits the low, slanting sun's rays to peep in our windows and warm our rooms, yet protects us from the heavy snows."

How we would like to take this balcony home for a breakfast alcove, we thought, with its pleasant view of the green mountains and garden.

On our return drive through the rolling hills, cupped in the Sarine Valley between gaunt mountains, we came across many men and children carrying large flat cans strapped on their backs. We stopped and had a look into the can of one jolly dairyman. It was chock-full of rich, creamy milk, still warm and bubbly from the milking.

PICKABACK MILK DELIVERY

The man told us he was taking it to the community dairy where it would be made into cheese. We asked if he would be paid. "Oh, no," he said, "we shall be credited at the dairy with the amount of milk brought in and later paid in cheese."

Driving on farther, we came upon a tiny cart loaded with two huge milk cans and pulled by a powerful Saint Bernard and a youngster no older than ten.

The boy gladly posed and smiled for us as we snapped his picture. His beaming face and that beautiful brown and white dog straining at the harness, evidently striving to take the load off his young master's shoulders, live in my memory (page 139).

We passed many another dogcart that evening, but none seemed so fine as the first. Sometimes we saw young girls and boys carrying the containers on their backs. Pleasant work, maybe, in summer, but no easy task on icy and snow-choked roads in the dead of winter.

As we approached the upper end of the valley, we could see afar off the turrets, conical roofs, and gray walls of Gruyères, poised on its forested hill like a ship breasting the crest of some green tidal wave. Yet the huge "ship" was dwarfed by the forested and pasture-clad peaks that towered above it (Color Plate XV).

The Counts of Gruyère chose well, when they selected this idyllic spot for their stronghold. Impregnable, it was the key to upper Gruyère, or upper Sarine Valley, which, in the clutch of the mountains beyond the town, forms one route, though roundabout, to the Rhône Valley and Lake Geneva.

HOW GRUYÈRE IS MADE

Before climbing to the village for the night, we stopped in at the *laiterie,* or white creamery building at its foot.

"Good evening, mesdames and messieurs," greeted the buxom cheesemaker as we entered. "Would you like to see how we make Gruyère?"

"Of course." So the good lady escorted us into the clean cheese-room.

"In these two large boilers is heated and mixed the creamy paste that later becomes cheese," she explained. The copper pots, at least seven feet across and about three feet deep, were polished until they shone like the binnacle of a smart ship.

"Milk, often still warm from the cows, is poured in, and rennet added," she said. "The mixture is heated and stirred with a special fork, or 'harp,' until it curdles and thickens. Next, helpers ladle out the paste and pour it into a burlap sack placed inside one of those round molds or hoops over on the bench.

CURING ROOM IS CALLED THE "LIBRARY"

"When the sack is full, the cloth is drawn across the top and the cover put on. The lever above is then pressed down and clamped. The cheese remains in the press overnight, while the excess liquid drains off. Next day, when the curd has congealed sufficiently, the cloth is removed and men carry the new cheeses down into the 'library,' or curing cellar" (page 159).

We descended to the dungeonlike room, and when our eyes had become accustomed to the dim light we saw rows and rows of closely stacked cheeses. Round, thick, and yellowish colored, they suggested grindstones piled one on top of the other.

Strangely, the air in this storage room was not bad, though, of course, we recognized Gruyère instantly! Ventilation was good, for there were small windows near the ceiling, and basement doors were open.

At one stack a man was busy washing the cheeses with a thick brine. He told us that one day he coats the cheeses with the liquid and the next wipes off that which has not soaked in. This procedure he repeats alternately for about four or five days. After some two weeks tiny gas holes, or "eyes," form inside the cheeses, and then they are stored for several months in a cooler room to age and season.

The disks, when ripe, are taken to the central cheese depot at Bulle, later to be distributed to waiting markets.

We considered buying a cheese to take home, but were surprised to find each round disk weighed about 80 pounds and cost $30! Transportation problems would be difficult, not to mention the "bouquet."

That evening, after we had dined sumptuously in mademoiselle's pleasant inn



Photograph by S. Glasson

DESCENDING FROM ALPINE PASTURES, HERDERS ARE WELCOMED WITH A THREE-DAY FEAST

This man, coming to town with two cheeses strapped to the back of his donkey, is husky and sunburned from his summer in the mountains. Perhaps his pay will be in cheese, because it forms a big part of the menu of these pastoral people. Wherever Swiss settled in American farming areas cheese industries grew up, and now large quantities are produced in these localities in Wisconsin, New York, and other States.

in old Gruyères, she asked us about our trip. Though our tales must have been familiar to her, she listened politely. Finally she said, "Today you visited the winter homes of our pastoral people. Why don't you go up tomorrow and see some of these happy herdsmen in their summer chalets?"

"Fine," we said, "but is it possible to go up in one day?"

"Of course. But why not visit a chalet on your way back to Geneva? If you follow the Sarine Valley and cross Les Mosses, surely you will be within sight of many high pastures. Stop your car there and climb up and visit one of those chalets."

COLOR IS THE KEY TO A CHALET'S AGE

Following her advice, we started off next morning. At first the road was a gentle incline crawling up the lower, grassy slopes. Then it entered a steep, rocky gorge and snaked along a narrow ledge high above the foaming white torrent. Green forested cliffs rose sheer above us. Climbing ever, it finally swung around a bad turn and came out in a green valley.

"Lilo," I remarked, "those little chalets over there with the slate roofs must be old as the hills!"

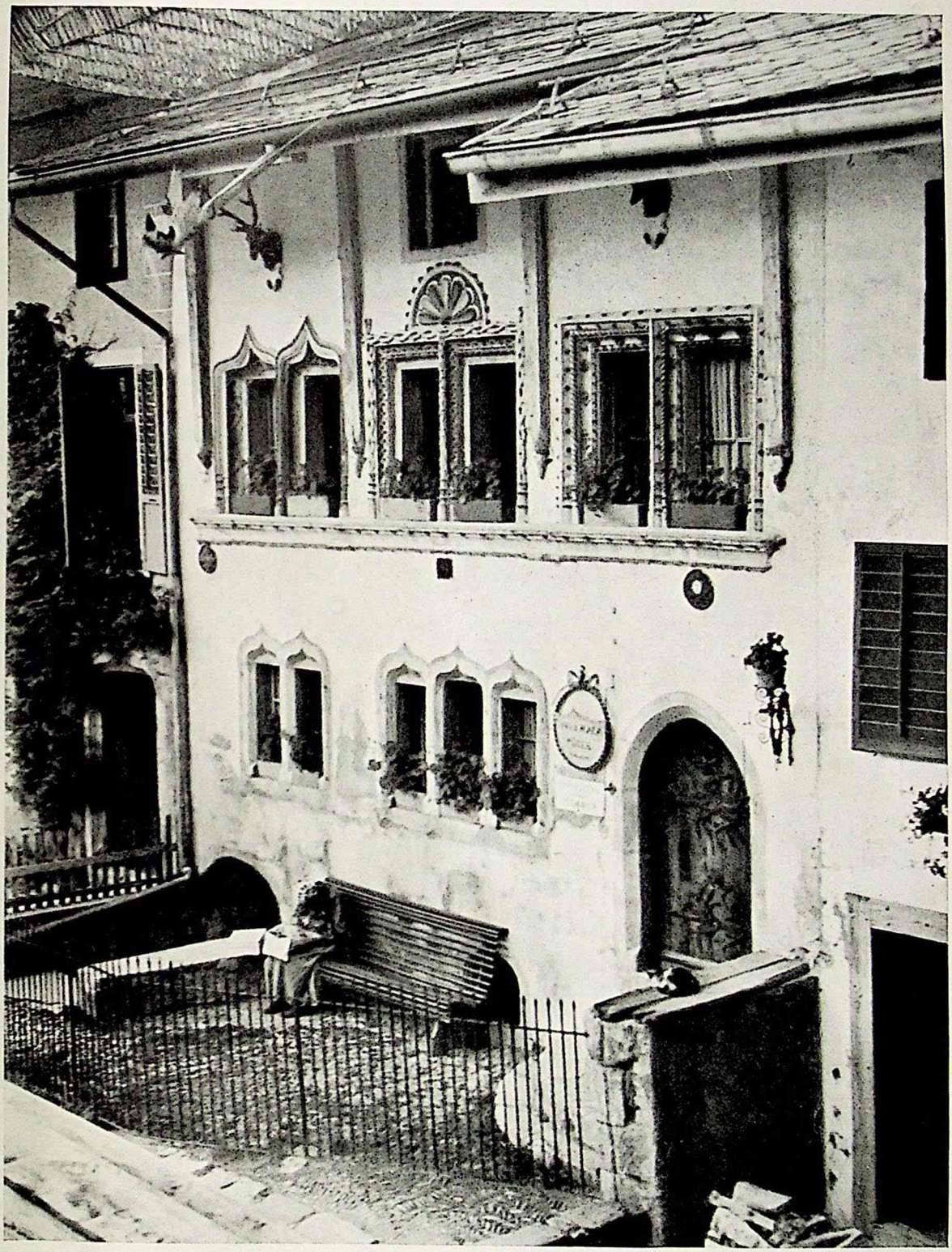
"Oh no, they aren't more than 20 or 30 years old," he said.

"How do you know?"

"You can always approximate the age of a chalet by its weathering. When new, they are creamy yellow, the color of new lumber. Exposed to a few winters' snows and rains, the walls become a golden brown. Then, as successive generations live in them and pass on, the houses become a darker brown. Hoary old-time chalets are almost black. Those over there are merely brownish!"

By this time we had crossed the meadow and found ourselves approaching a steep, forested hillside dead ahead. Where could the road lead? A dead end?

Suddenly we found out. A sharp turn and up we started. Soon the car slowed



Photograph by Melville Bell Grosvenor

DEER HEADS, GARGOYLES, AND TWIN WINDOWS DECORATE CHALAMALA'S MEDIEVAL HOME

Geranium boxes; brightly painted armorial windows, arranged in pairs; and a carmine arch framing the door make this house of the court jester a focal point for visitors. The old woman on the bench, busily making lace, remains bent over her work for hours at a time, never looking up to view passers-by. Her cat basks in the sun on the wall, and firewood is stacked ready for winter. Chalamala's prophecy that "the Bern bear will some day eat the grue (crane of Gruyère) in the caldron of Fribourg" was fulfilled when the Count's feudal domain was sold to those two cities many years later (Plates VIII and IX).



Photograph by Morel

"COME! COME! LARGE AND SMALL, THE BLACK, THE WHITE, THE SHORT, THE TALL—UNDER THE OAK TREE COME. HA! HA! LIOBA!"

On still evenings the hills reverberate with such verses of "Le Ranz des Vaches" as herders sing while driving in their cows (page 137). When several herds are mingled, the animals often recognize their owners' voices, separate, and file back to the milking ground.



Photograph by Perrochet-Matile

UNDER THE WATCHFUL EYE OF THE MASTER HERDER YOUNG MEN MAKE THE FAMOUS GRUYÈRE CHEESE

One stirs the curds with a "Swiss harp," while the "cabin boy" builds a fire beneath the copper caldron (Plate XIV and page 160). At left are the cheese presses and above is a frame for carrying the disks to market. Herders wear blue costumes and straw caps and suck big curved pipes.

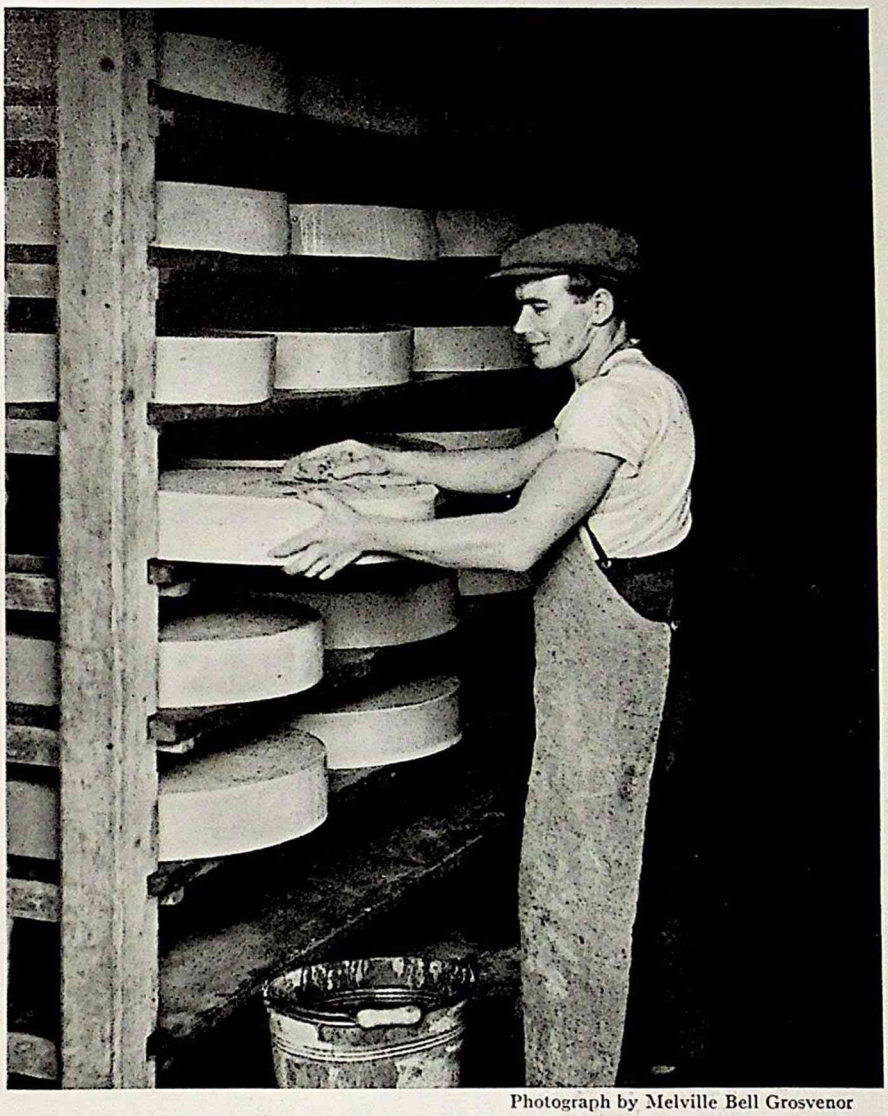
from the steepness of the grade, and we slipped into second. Ultimately we were thankful for the push of low gear.

Up and up we mounted, twisting and turning, over a highway so crooked, Lilo said, "it would break a snake's back!"

The road was wide enough for only one car. My wife, at the wheel, kept sounding the horn at every bend until the noise became unbearable.

But, actually, how thankful we were for that same horn! It was to us what the foghorn is to the mariner. When strong blasts echoed faintly above us, we knew another car was approaching. Whichever machine happened to come first to one of those wide places in the road —"switches" we called them— provided at convenient spots, the driver would stop and await the other car.

Often there were only inches to spare between the outer wheels and the sheer face of the mountain. Lilo called it "alpine climbing in an automobile."



Photograph by Melville Bell Grosvenor

NOT GRINDSTONES STORED IN A SHOP, BUT FAT DISKS OF GRUYÈRE!

In the cellar, or "library," of this coöperative cheese factory an attendant washes the "wheels" with a brine solution which aids fermenting or "ripening" (page 155). Soft and rubbery, these are only about two weeks old. Most Switzerland cheese imported by the United States comes from the Emmen Tal, in Bern Canton. Native Gruyère is nearly all consumed locally.

CHALETS CLING TO STEEP HILLSIDES

Gradually, the fir trees thinned and we came to a lush meadow near the top. High above us rose a steep, grassy slope. It was peppered with isolated chalets joined by a cobweb of paths.

"This is the place," we all agreed, and, piling out, started up.

While from the car the huts had seemed close, we found the climb more than we had bargained for. That heights are deceptive, we were soon reminded. But we kept on, guided by Lilo, who we knew had summered in such a chalet as a boy.

Puffing from the effort, we approached a chalet. It was a very dark-brown one, roofed with thick slate held down by stones.

"I believe it's a herder's hut, all right,"

called Lilo. "See, it is low and one-storied. The herders live in that half of the house, and the cattle are milked in the other when the weather is bad."

Out of the door popped a stern, bearded man, evidently surprised to hear a foreign tongue. Pipe in hand, he watched us solemnly.

Lilo addressed the old man. His face wreathed in smiles, and he invited us in, with apologies for the bareness of his quarters.

THE CHIEF HERDER INSISTS ON STRICT DISCIPLINE

They were in the midst of cheese making. Our friend, who it soon appeared was master herder, conducted us around. He was as much the master of his little world as the "skipper" on the bridge of a ship. Full responsibility for the herds, the cheese making, and the men was in his hands—and he felt it.

The room was large and quite plain. A strapping assistant herder, not deigning to remove his pipe, kept on stirring the new cheese in a huge copper kettle. Another lad was busy keeping the fire going on the hearth beneath the pot, the smoke drawing swiftly up a cone-shaped chimney above (page 158).

This lad is the "cabin boy" for the herders. His duties are analogous with those of his seagoing counterpart, with a few "lubberly" jobs thrown in, such as carrying in the milk and guarding the goats.

INVITED TO "ALPINE TEA"

In the corner we saw the cupboard for the wooden milk buckets, and on a bench against the wall the cheese press, now becoming familiar to us. Hanging near by was a strange-looking wooden saddle or frame. Our host called it an "oiseau." Daily a robust herder, he said, carries this "bird," with a heavy flat cheese perched on it, down to the village (Color Plate XVI and page 158).

"Would you like some Gruyère cream?" the master herder asked. Gladly we accepted, for we had been hoping all along for an invitation to "Alpine tea."

For seats our host showed our party plain benches, but I preferred to balance myself on a one-legged milking stool.

A large bucket filled with thick cream was put before us. Handing each a large wooden spoon, the herder invited us to help ourselves from the common bowl. The cream, though somewhat cloying, was delicious.

"It is too bad you cannot come to Gruyère in May or June," he said, as we partook of his simple hospitality. "It is then that we leave the village in a grand procession and come up to these summer lands.

"You would often see whole families moving with all their belongings. The herds go first, led by the queen or strongest cow, her huge bell jangling. Next come the goats and then the wagons laden with caldrons, pots, cheese press, and clothes.

"All summer we remain in the mountains, caring for the cows, milking, and making cheese. When the first snow falls, we start for home and revel in the grand feast that lasts for three days and nights.

"If our herds have increased, the market is good at Bulle, and, above all, if our cheese is well flavored, then we consider the season a good one and everybody is pleased."

Saying good-by to the "skipper" of this mountain cheese factory, we flung ourselves down the hill and climbed into the car, again bound for Montreux.

From time to time as we drove over the pass, there were breaks in the trees, and we could catch glimpses far below of the green fields we had crossed only shortly before. The chalets dotting the valley and the cows grazing seemed tiny toys. Would that we could bring these "toys" home to our children, but they are safely tucked away among our memories of happy Gruyère.



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Finlay Photograph by Bernard F. Rogers, Jr.

FOR NEARLY FIVE CENTURIES GRUYÈRE COUNTS HELD SWAY IN THIS TURRETED CASTLE, OFTEN RESTORED

Valiantly they defended their stronghold. The last of the line, Michael I, became indebted to Fribourg and Bern, so that those two cantons swallowed up his little feudal state in 1555. In the last century, the Château was put up for sale and an artist bought it for its junk value. He repaired the building, and many of his friends, including Corot, painted panels on its walls. Beyond the Castle, Dent de Broc is veiled in mist.



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"MAN'S BEST FRIEND" IS ALSO HIS HELPER IN BERN

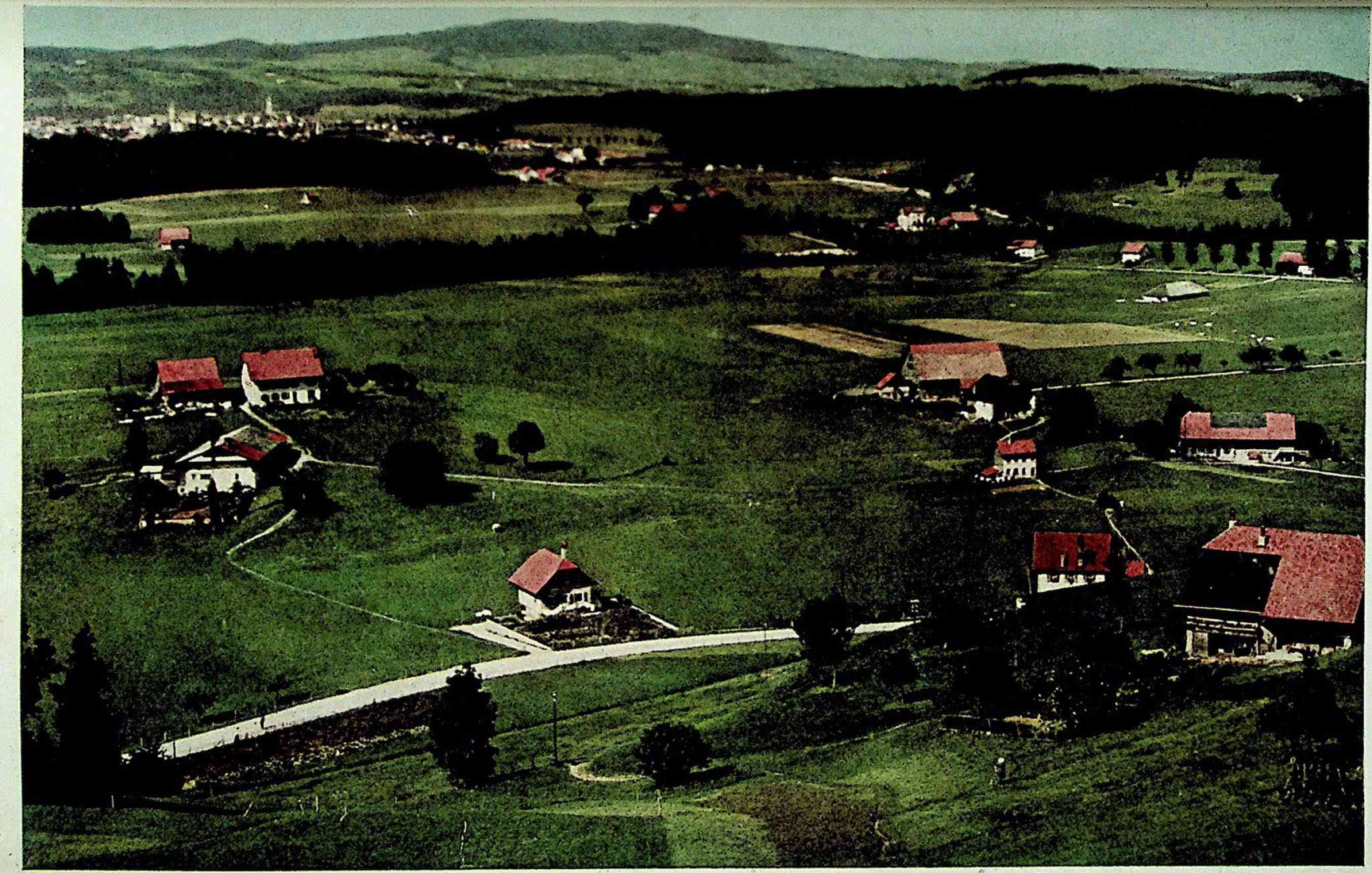
At the hospice on the Great St. Bernard Pass, huge animals, specially trained, locate and succor snow-bound travelers. In the valleys, dogs haul carts for grocer, dairyman, or children.



Finlay Photographs by Bernard F. Rogers, Jr.

EVERY VISITOR TO GRUYÈRES BUYS A DOLL

Many of the figures are made by the townsfolk, but all are not garbed Gruyèrien style. The young lady keeps hers in an old-fashioned cradle. Swiss treasure their costumes, but wear them only on holidays.



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Finlay Photograph by Bernard F. Rogers, Jr.

FARM HOMES AND BARNS PEPPER THE GREEN MEADOWS IN THE VALLEY AROUND GRUYÈRES

During spring and autumn herds graze in the fields, but in summer the cows are on high pastures. When deep snow blankets the ground the animals remain indoors. Some of these houses are of the "two-family" variety, the owner living in one half and the cattle in the other. In the far-distant left is Bulle. Once, according to Gruyèrien legend, when Bernese invaders threatened, every man turned out to stop them. Housewives and children tied torches to the goats and drove them at night across the slopes below the town. The enemy, seeing this "army," turned and fled.



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Finlay Photograph by Bernard F. Rogers, Jr.

GRUYÈRES' HOMES CLING AROUND THE COURTYARD, LIKE OLD WOMEN HUDDLED IN A CIRCLE OVER THEIR KNITTING

Flower-boxed windows make balcony seats for the villagers when Gruyèriens celebrate the August 1 fete in the town's one and only street (Plate III).



© National Geographic Society

NOT FORGOTTEN IS THE ART OF KNITTING STRAW

The old lady says she is the only person in Gruyères who still makes mats, baskets, and hats by this old-fashioned method. On warm days she often sits on her doorstep in the court making lace.



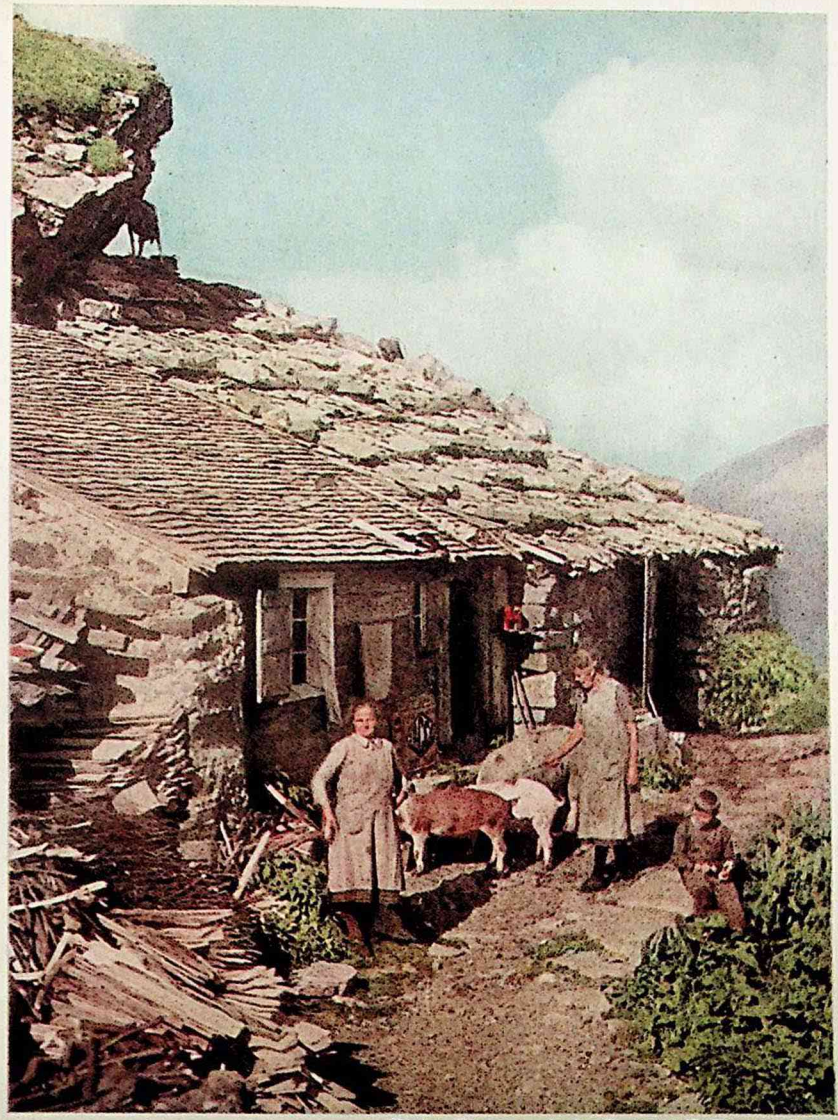
Finlay Photographs by Bernard F. Rogers, Jr.

"RADIATORS" IN GRUYÈRES ARE ALSO DECORATIVE

Every home has such a wood-burning stove, but not all are surfaced with attractive glazed tiles. Three "steps" provide seats for those who wish to warm themselves.



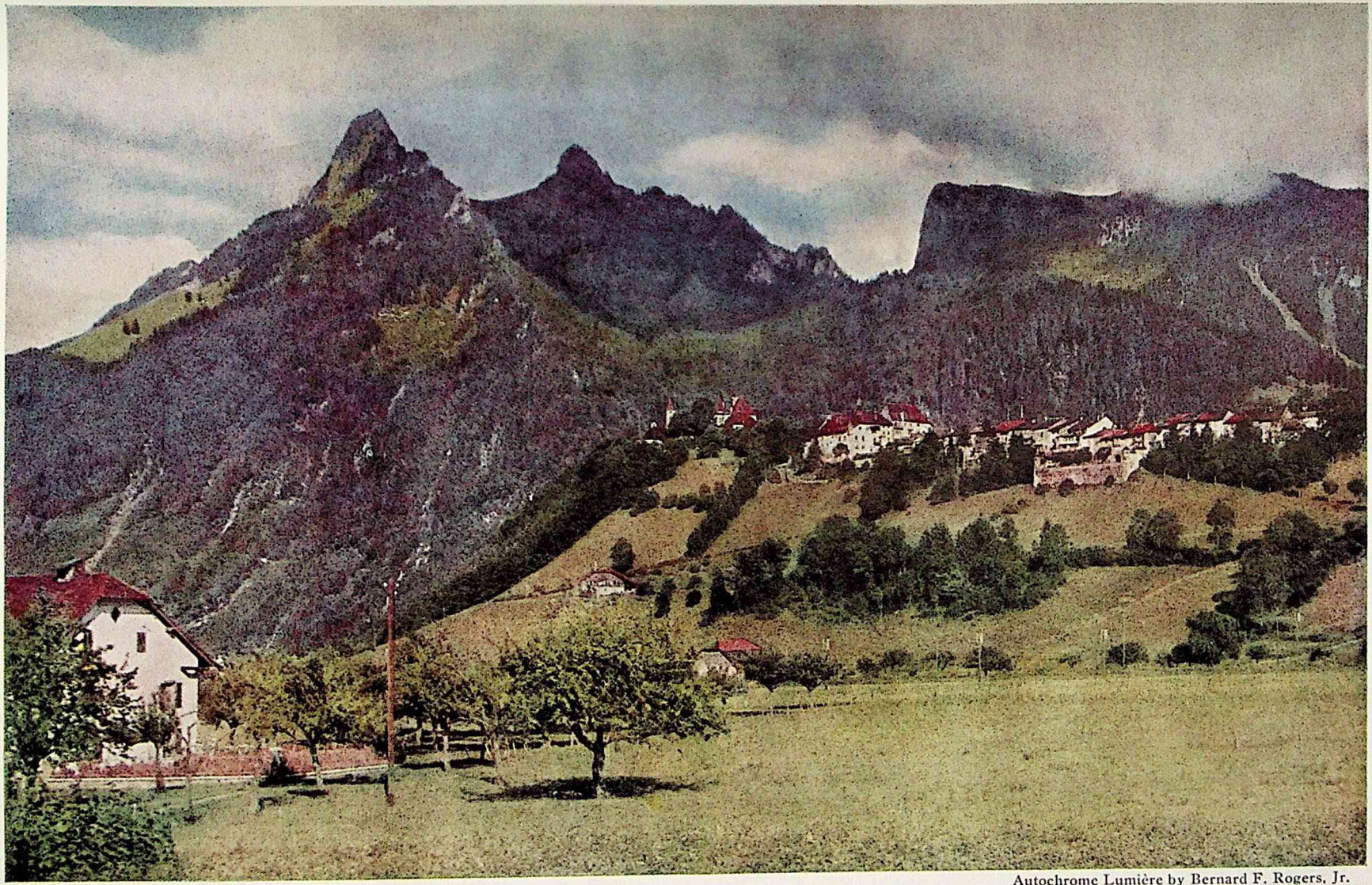
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Finlay Photographs by Bernard F. Rogers, Jr.

HERDERS AND THEIR FAMILIES LIVE IN SUCH CRUDE HUTS WHEN THE COWS GRAZE ON HIGH PASTURES

Cheese makers on the Furka Pass discuss the quality of their product and wonder whether the patches of snow on the peaks above indicate an early autumn (left). One man holds a "Swiss harp" for stirring the curds in the caldron, while the other has under his arm a small cheese ready for market. Callers on the housewife (right) would expect "Alpine tea"—clotted cream or curds. Pigs, goats, and cows occupy the "addition" under the stone slab roof, while the family lives in the left half of this home on Klausen Pass. A goat rests in the shade on top.



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Autochrome Lumière by Bernard F. Rogers, Jr.

GRUYÈRES RIDES ITS HILL LIKE A PHANTOM SHIP BREASTING A GREAT GREEN WAVE

High mountains that nearly surround the little town served as a barrier to invaders and now isolate the district, preserving traditions, customs, and the French dialect. Overhanging balconies and galleries of the houses served for defense and as lookout posts, rather than as vantage points to view the lovely valley below. Pathways leading up, from the center of the picture and from the right edge, meet at the walled entrance. Three of the tall peaks, or "teeth," that tower above Gruyères show here—Dent de Broc (left), Dent du Chamois (center), and flat-topped Dent du Bourgoz (right).



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Finlay Photograph by Bernard F. Rogers, Jr.

IN AN "OISEAU," OR "BIRD," A HERDER BRINGS HOME A FAT CHEESE FROM THE SUMMER CHALET

Carrying the disk in this strange wooden frame, he has trudged down miles of mountain paths. "Eyes," or gas holes, in genuine Gruyère are sparsely distributed, and its taste, when fully cured, is rather sharp and not so mild as that of other Swiss varieties. It is not colored artificially, and when ripe is of about the same shade as fresh butter.

NEW SAFEGUARDS FOR SHIPS IN FOG AND STORM

By George R. Putnam

Commissioner of Lighthouses, Retired

THE most magnificent of all lighthouses was built before the dawn of New Testament history, but the most remarkable of navigational safeguards has come only in the past few years.

Day and night a monotonous drone of dots and dashes goes out over the sea, penetrating the thickest rain and fog, to help bring the voyager safely home.

Today radiobeacons are essential equipment on our most important lightships and lighthouses, and apparatus for receiving radiobeacon signals is carried on all modern passenger liners and many other vessels.

Thus, after more than 2,200 years, we approach the solution of one of mankind's oldest problems. The lofty Pharos of Alexandria, erected by the Ptolemies near the mouth of the Nile, has never been surpassed by any other lighthouse in height or in fame (page 174). Its name became the word for lighthouse in the Romance languages; the French use it in *radiophare* (radiobeacon).

But the signal which this magnificent tower gave to mariners was the light and the smoke from an open fire. No progress was made in marine signal lights for many centuries. Only a hundred and twenty-five years ago tallow candles burned in the famous Eddystone Lighthouse near the English coast, and until 1816 the May Island Light, off Scotland, still used a blazing coal fire to guide ships.

Nearly all the major advances in lights and fog signals—the electric lamp, the incandescent oil-vapor light, the Fresnel lens focusing the beam in the horizon of the mariner, the fast-revolving light making it possible still further to gather the rays into powerful beams, and the fog bells, followed by the whistle, siren, and diaphone—have been developed within a little more than a century.

Only in the last 30 years has so necessary an aid been employed as the lighted buoy, boon to the navigator who must bring his vessel into port at night through treacherous shoals and narrow channels.

The most notable advance was made 15 years ago, when radiobeacons were placed by the U. S. Lighthouse Service on Ambrose Channel Lightship and two other stations in the approaches to New York. Thus was solved an age-old problem. Only the radio signal penetrates fog and rain that blot out the most brilliant light.* It can carry its message of safety through storms that drown the most powerful whistle.

Above the pilothouse of a modern liner you will see a small rotating coil antenna mounted on a metal frame. This coil receives radiobeacon signals now sent out from important lighthouses and lightships —more than 120 of them on the coasts of this country.

THE RADIOBEACON AT WORK

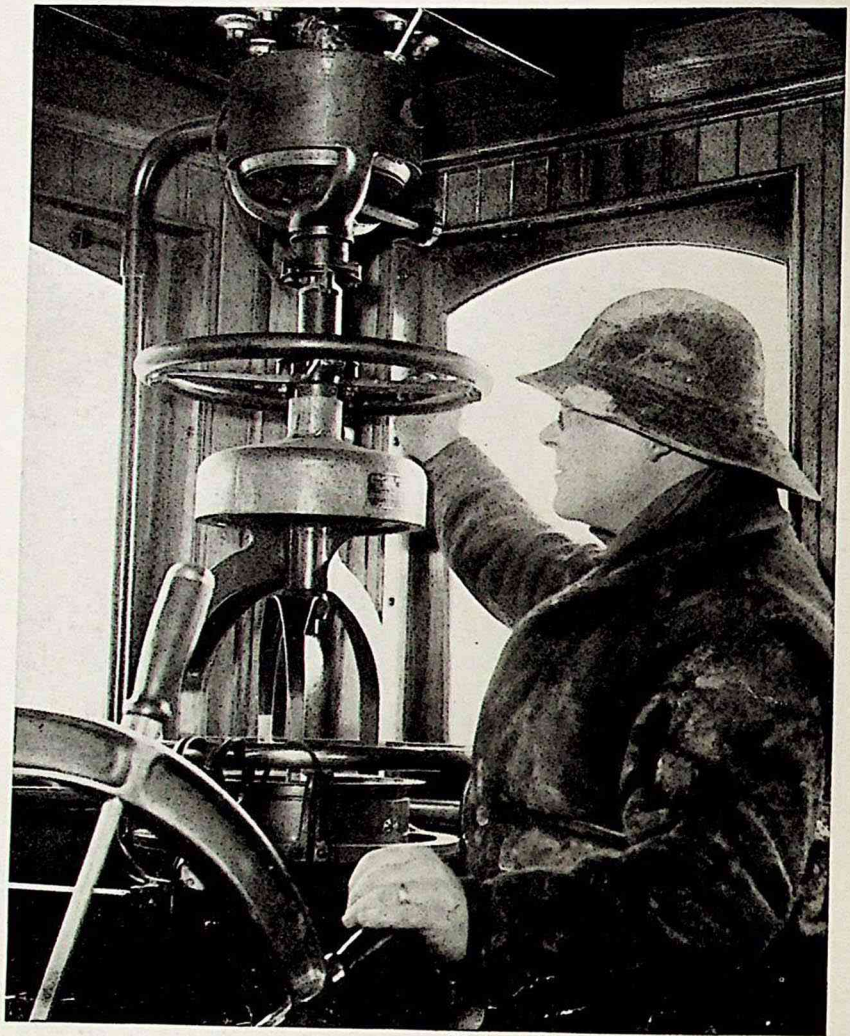
In approaching the coast, the navigator of a ship with this coil picks up a radiobeacon signal—perhaps the four dashes from Nantucket Shoals Lightship, or the single dots from Ambrose. By rotating his radiocompass coil until the signal fades away ("taking the minimum" it is called), he determines the direction from which the signal comes, even from distances of more than a hundred miles (page 170).

Anyone who has stood on the deck of a liner in a dripping fog, and has wondered at the courage of the navigators going ahead toward the unseeable, must realize what a blessing this is to tense nerves—how valuable is this gift of science to better navigation and to safety at sea.

Radiobeacon systems now are being extended throughout the world, and radio direction-finders are being placed on more and more vessels, recently even on fishing craft. There also are direction-finding stations on shore which give radio bearings to ships asking for them.

These radiobeacons have added some 1,500,000 square miles of water to the area served by United States aids to navigation. In fact, their signals may carry far beyond this area. While off Nova Scotia, for example, the *Bremen* once took bearings on the radiobeacon at Colón, Panama, more than 2,000 miles away.

* Other Government agencies have done pioneer work and have cooperated in the development of radio navigational aids, including the Navy, the Army, and the Department of Commerce, especially the National Bureau of Standards and the Bureau of Air Commerce.



Photograph by U. S. Lighthouse Service

"TAKING THE MINIMUM" ABOARD SHIP

All modern liners, and even some fishing vessels, are equipped with this important direction-finding device. With it a bearing may be taken on a radiobeacon station by rotating the coil until the signals "fade out." This is known in the pilothouse as "taking the minimum." The pointer then indicates on the magnetic compass below the direction from which signals come (page 169).

A simple arrangement for distance finding is now in use at a number of stations, especially on the Great Lakes. The radio signal and the sound signal are synchronized to be sent at the same instant, and the difference in the transmission time, as measured by a stop watch, gives the approximate distance of the vessel from the station. This is easily computed when it is remembered that sound in air travels approximately a mile in five seconds. The distance, therefore, is roughly the "time lag" divided by five.

A comparison of the number of Great Lakes ships which stranded during the four years preceding the use of radiobeacons, with the number for the four years following, indicates a 50 percent reduction; also the saving of time by vessels taking radio bearings is a large factor in economical navigation.

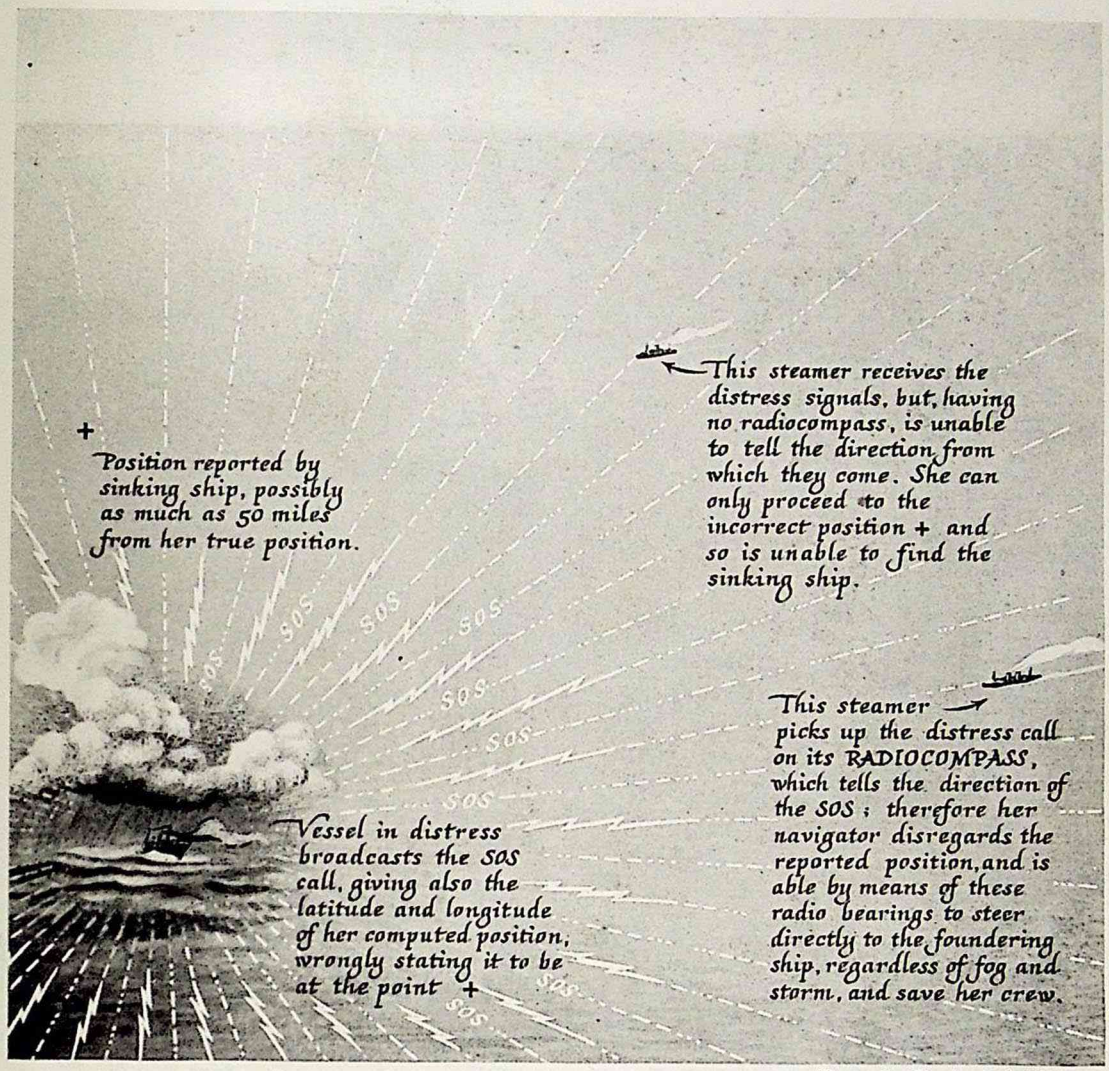
The dramatic use of SOS calls in dangers and tragedies of the sea is familiar enough.* Radiograms to and from friends on shipboard are commonplace. Radio also serves navigation in transmitting the correct time, a service of prime importance in determination of longitude at sea.

TAKING RADIO BEARINGS ON A SHIP IN DISTRESS

When wrecks obstruct channels, or when storms drag buoys from their normal locations, radio affords a valuable means of broadcasting such urgent information. Radio also transmits reports from mariners who observe defects in navigational aids.

A vessel equipped with a radiocompass can take a bearing on another ship sending radio signals, and thus determine its direction at sea by the same method it would use with a radiobeacon on shore. This taking of bearings between ship and ship diminishes the risk of collision in fog, and it also helps one ship to find another which may be in distress. The rescue of the crew

* SOS, since 1912, has been the international radio distress signal. The letters have no verbal significance, but were adopted because they are easily sent and readily understood. In code, SOS consists of three dots, three dashes, and three dots.



Drawn by Charles E. Riddiford

A RESCUING VESSEL LOCATES A SHIP THAT GAVE THE WRONG "ADDRESS"

When a steamer in distress in fog or storm reports an incorrect position, it now can be reached by ships equipped with radio direction-finders. So that the directional apparatus may pick up the faint signals, the wireless operator of the sinking vessel must stick to his post, flashing out SOS or other messages as long as he can.

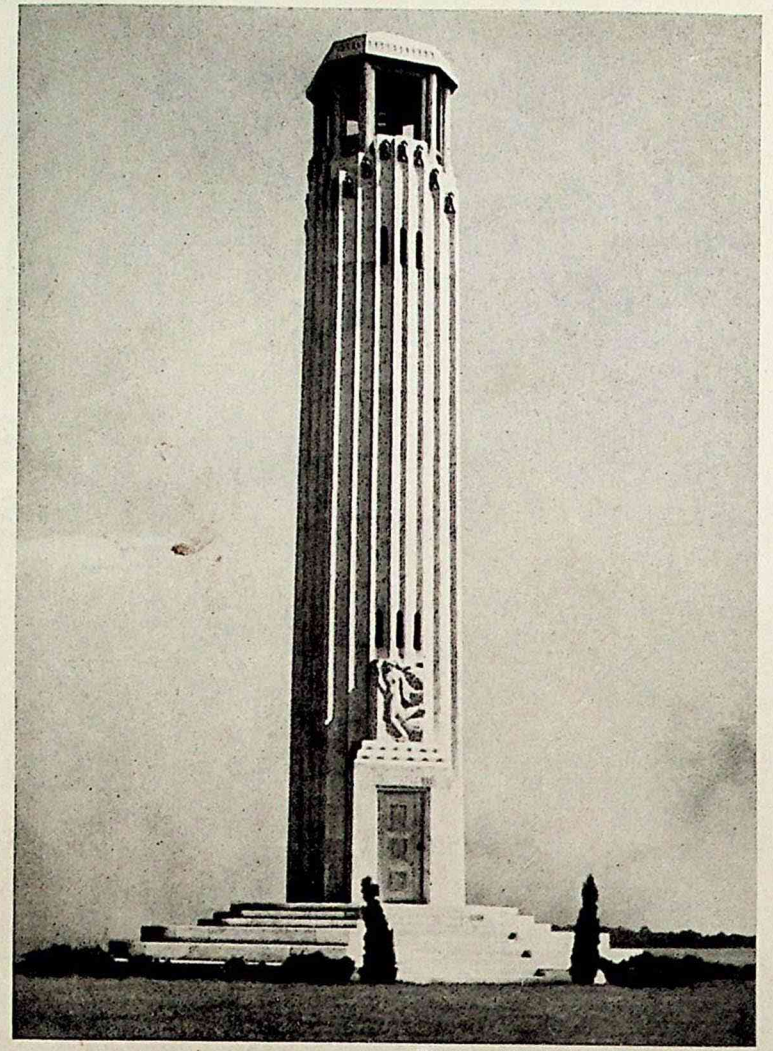
of the British freighter *Antinoe* by the United States ship *President Roosevelt* in mid-Atlantic in January, 1926, is a notable example of this use of radio bearings.

Capt. George Fried, then master of the *Roosevelt,* immediately changed his course on receiving the SOS, and radio bearings on the *Antinoe* were taken every 15 minutes. He found the *Antinoe's* position as given was some 50 miles in error; but, steering by the radio bearings, he reached the *Antinoe* in about six hours. After three and a half days' heroic struggle, the 25 men of the sinking *Antinoe* were rescued.

Tragic loss of 42 lives, through lack of equipment for taking radio bearings, is shown in the wreck of the *Alaska,* which sank the very year that radiobeacons came into use.

One August day in 1921, the *Wahkeena,* in a dense fog off Cape Mendocino, California, picked up an SOS call from the *Alaska.* Having then no device for telling from which direction came the call for help, the *Wahkeena* cruised for ten hours before she could find the sinking *Alaska.*

The picture which sticks in his mind, says the radio operator saved from the doomed ship, was that of the *Wahkeena* only 12 or 13 miles away, "trying, all night,



Photograph by U. S. Lighthouse Service

A MEMORIAL AND LIGHTHOUSE COMBINED

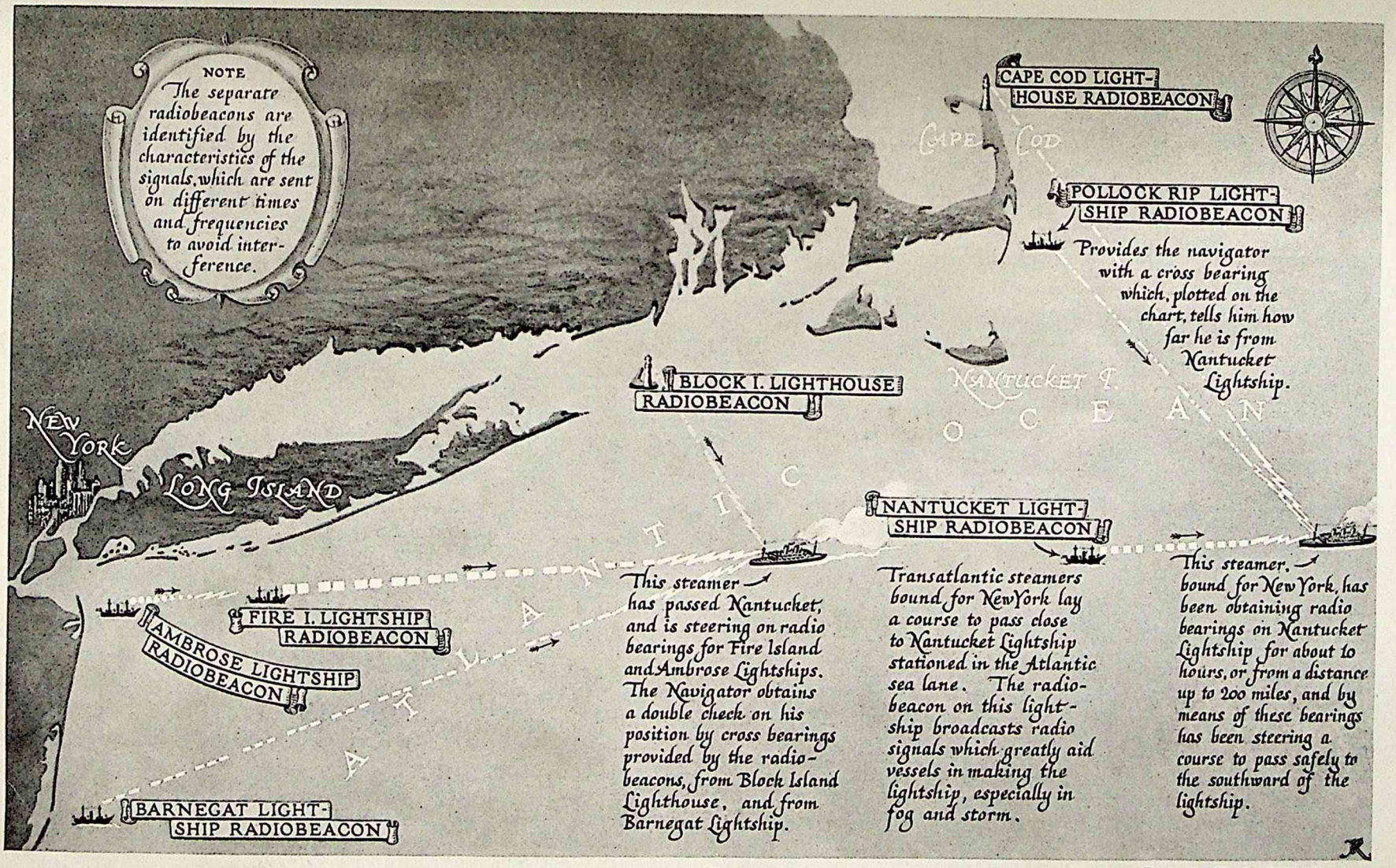
The beautiful marble William Livingstone Memorial Lighthouse at Detroit, built on Belle Isle by private subscription, provides a navigation mark for all vessels bound down the St. Clair and Detroit Rivers. The light is maintained by the Government. The architect was Albert Kahn, of Detroit.



Photograph by Edwin L. Wisherd

THIS IS THE GRANDDAD OF AMERICAN LIGHTS

Sandy Hook Lighthouse, New Jersey, at the entrance to New York Bay, built of stone by the Colony of New York in 1764, is the oldest standing lighthouse still in service in this country. The walls, seven feet thick at the base, are lined on the inside with brick.



Drawn by Charles E. Riddiford

FRIENDLY DOTS AND DASHES ENABLE A LINER'S SKIPPER TO "SEE THROUGH" FOG OR SNOW AND BRING HIS SHIP SAFELY INTO PORT

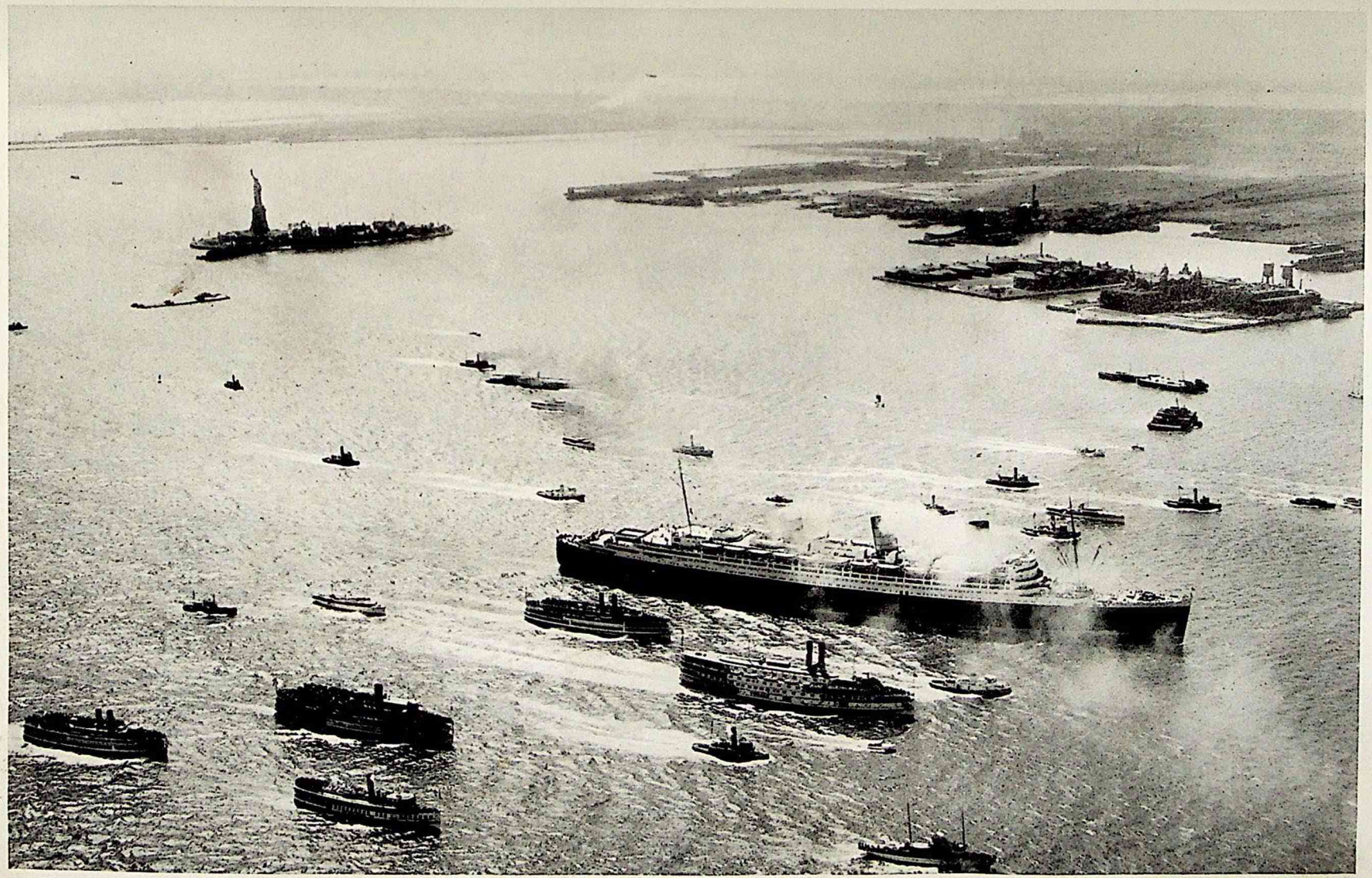
Each radiobeacon has a different signal, indicated by white dots and dashes on the drawing. They have proved highly important aids to navigation because they enable ships to steer a proper course in foul weather or fair.



Drawn by Hashime Murayama, courtesy Illustrated London News

LARGEST AND TALLEST BEACON EVER BUILT WAS THE PHAROS OF ALEXANDRIA, ONE OF THE SEVEN WONDERS OF THE ANCIENT WORLD

It was completed about 280 B. C., under Ptolemy II, and the tower was approximately 400 feet high. For more than a thousand years an open fire in the lantern guided Mediterranean galleys and early sailing ships to the chief port of Egypt. Its fate is a mystery, but its tumbled ruins were said to be visible until about 1350. The drawing above is based upon recent historical research.



Photograph by Fairchild Aerial Surveys

FRANCE'S GIFT TO AMERICA JOINS IN THE WELCOME TO THE "QUEEN MARY"

The torch held aloft by the Statue of Liberty is now only decorative. Hospitable New York greets Great Britain's "ocean queen" with crowded excursion steamers and tugs, yachts, airplanes, and a chorus of raucous whistles. Ellis Island appears at the right. The British have contributed enormously toward improved navigation throughout the world by charting remote coasts, even those outside British territory, and encouraging other nations to improve their lights and buoys.



Photograph by Dr. H. S. Palmer

"HE FLOATS THROUGH THE AIR—!"

When a supply ship arrives at Kaula Rock Station, Hawaiian Islands, men must be swung to the end of the narrow trail cut into the side of the rock. The same rope is used to hoist supplies (page 182).

to locate us while many unfortunate human beings were clinging to floating wreckage and succumbing slowly to exposure."

Pioneer use of radio in the Lighthouse Service began in 1901, when an experimental radio set was installed on the Nantucket Shoals Lightship. About four years later, during a severe gale, the lightship sprang a leak and her operator kept spelling out the word "help," as no SOS or other distress call had then been adopted. Coming to the lightship's rescue, the tender *Azalea* got a hawser to the sinking ship and started towing her to New Bedford. Though she sank on the way, her crew of 13 men was saved.

Today, of course, all outside tenders and lightships use radio, and a number of isolated light stations and some tenders are equipped with radiotelephones, which greatly facilitate reports and orders in emergencies.

At remote stations, the lightkeeper's life long has been a symbol of loneliness. Before the days of radio, all the keepers heard was wind and waves, sea birds, or the foghorns of passing ships. During a period of bad weather in 1912, no tender could reach the lighthouse on Tillamook Rock, Oregon, for seven weeks (p. 187). The station on Cape Sarichef, at the entrance to Bering Sea, went for ten months without any mail or news—August, 1912, to June, 1913!

Radio changed all that.

"Before we got our radio," wrote one keeper, "a new President might have been elected a month before we knew about it. . . . This time, we heard it as soon as anybody. The last two big prize fights, when it was announced who was champion, we heard it. . . . We listen also to ministers preaching, and there is singing. It is almost the same as being in church. . . . When storms blow, our sets keep us posted; we can take all necessary precautions and follow the progress of the hurricane."

THE LIGHTSHIP, OUTMOST SENTRY OF SAFETY

Look over the rail as your liner sweeps by Nantucket Lightship. If it be a misty evening, you will see a small red vessel, only 149 feet long, rolling in the sea, and you will note the quick flash of its brilliant electric light and hear the tireless blasts of its fog signal. This is the new *No. 112*, which recently replaced the relief lightship, *No. 106*. *No. 106* was rushed to the Nantucket station within 24 hours after the

regular station ship was sunk by the liner *Olympic* in May, 1934 (page 182).

Anchored in deep water and close to steamer lanes, a lightship is a valuable aid, because vessels may pass it on either side.

These are by far the most costly aids to navigation, and their use must be limited to positions where the value of the service to shipping justifies the expense. The eighteen outside lightships off the Atlantic coast and the five off the Pacific coast are the outmost sentries off our shores.

Lightships have repeatedly given refuge to the shipwrecked.

A German submarine raider visited Newport in 1916, before we entered the World War. Later, it went out and made its lair near Nantucket Lightship, where, until the alarm spread, vessels were constantly passing. The submarine sank a number of unarmed merchant ships, the crews of which took refuge on the lightship. At one time there were 115 shipwrecked men aboard the lightship, and 19 ships' boats were trailing on a line astern.



Photograph from Keystone

GUARDIAN OF THE TURKEY POINT LIGHT

Mrs. Fannie M. Salter is the only official woman lighthouse keeper in the United States. At her Maryland station near the head of Chesapeake Bay she cleans and fills the old-fashioned oil lamp used at night, and tolls the lighthouse bell to guide ships during heavy fog and rain.

As bad weather ensued shortly, and the locality is 47 miles from the nearest land, it is certain that many of these seamen would have lost their lives had it not been for the haven provided by the lightship.

The only navigational aid in this country destroyed by the enemy during the World War was the Diamond Shoal Lightship off Cape Hatteras.

On the afternoon of August 8, 1918, a submarine raider began firing at a merchant ship about a mile and a half away. The lightship broadcast by radio a warning to other vessels in the vicinity, and this was undoubtedly the means of saving many ships. But it resulted in the submarine's firing six shots at the lightship and later returning and sinking it by gunfire.

The crew got away in boats, and, after seeing the ship go to the bottom, they landed safely that evening on Cape Hatteras.

Blunts Reef Lightship marks the outer limit of rocks off Cape Mendocino, a wild and desolate section of the California coast.

At 1:30 on a June morning in 1916, the lookout reported a boat hailing the lightship. On coming alongside, the officer in



Photograph courtesy The Washington Post

SERVICING A HUGE "TRAFFIC LIGHT" OF THE SEA

Only when these floating sentinels are hauled alongside the lighthouse tender may one obtain a true idea of their size and sturdy construction. Here the crew of the tender *Orchid* is unbolting a tank cover on a buoy off the Virginia coast, preparatory to lifting out an acetylene gas tank and replacing it with another cylinder. The buoys are examined and the gas supply is replenished about four times a year. At least once a year the buoy is taken up for cleaning and replaced by another.

charge stated that the steamship *Bear* had stranded between the cape and False Cape Rock. In all, nine lifeboats came alongside, and 155 people from the *Bear,* including many women, were taken aboard the lightship and given hot coffee and warm bedding.

Other lifeboats arrived later with more survivors. Eventually all these people were transferred to land by the steamer *Grace Dollar.*

This all happened during dense fog which had lasted for two days, with the station fog signals sounding regularly. Now a radiobeacon has been placed on Blunts Reef Lightship.

Because they are moored close to steamer lanes lightships are themselves liable to various kinds of catastrophe, chiefly collision, but radio permits the immediate summoning of aid.

In 1916, Fire Island Lightship, in the approach to New York, was rammed by the steamer *Philadelphian,* and her side cut open for four feet below the water line.

The ship was saved from sinking only by the remarkable presence of mind and quick work of her crew, who shifted weights, slung out boats, and filled them with water, so as to list the vessel and bring the damage above the water line.

A LIGHTSHIP THAT SERVED MORE THAN 75 YEARS

Lightship *No. 1* was retired from duty in 1930, after 75 years of service. This vessel was built for the station then known as Nantucket New South Shoals, and remained on this exposed station for 36 years, with only sails for power.

"If this ship could talk, what a story she might unfold!" wrote a Baltimore editor. "She was still in her early youth when the new armor-clad *Merrimac* wrought havoc on wooden vessels in Hampton Roads. She saw the transition from wood to iron and from iron to steel. From her vantage point off Nantucket, what a host of vessels have spoken her! Day after day and year after year, in fair weather and foul, her sturdy ribs of oak have withstood the thrashing of the waves."

In early years it was not easy to maintain lightships on outside stations. The first attempts in this country were made at Sandy Hook, at the entrance to New York Bay, in 1823, and at Diamond Shoal, off Cape Hatteras, in 1824. In the latter case the ship broke from her moorings within a few months, and, after being replaced several times, was wrecked in 1827. It was 70 years before another lightship was placed off Diamond Shoal.

Marked advance has since been made in lightship design. The breaking strength of mooring chains has been doubled; even a West Indies hurricane passing up the coast seldom parts a mooring.

In the gale of September, 1933, Diamond Shoal Lightship dragged her 5,500-pound mushroom anchor five miles, but the mooring chain withstood the tremendous strain.

MANY NEW DEVICES USED

Our coastal lighthouse system was fairly well completed in the last century. Structures which house the great lights of today were for the most part built from 60 to 80 years ago.

Progress in recent years has been more in technical improvements, making use of radio, electricity, new illuminants, and improved fog signals.

Now and then, however, changes must be made in the primary stations themselves; new needs call for new stations, the abandonment of old towers, or the substitution of less expensive automatic lights.

Six light stations of the first rank, recently completed, show the different needs that occasionally arise. At North Manitou, in the northern part of Lake Michigan, a station has been built in 22 feet of water to take the place of a lightship. Two other similar stations have recently been completed in this lake.

At Cape Decision, Alaska, a new light and fog signal station stands in a key position for the navigation of southeast Alaska, situated as it is at an entrance from the outside, and at a turning point for the inside passages.

At the south end of Santa Barbara Channel, off the coast of California, navigation is now safeguarded by the station on Anacapa Island, a guide both to coasting vessels and to those approaching Los Angeles from the open sea.

The sixth of these new primary stations stands at the entrance from Lake Huron to the St. Mary's River, where it was necessary to have a guide close to the channel for the Lake Superior traffic.

The most powerful light in the American lighthouse system shines from a low struc-



Photograph by U. S. Lighthouse Service

SUCH "LOUD-SPEAKERS" MAKE A LIGHTSHIP'S VOICE HOARSE

Automatic apparatus accurately times the compressed air blasts, so that the sending station may be identified. This lightship on Fire Island Station is one of the newest in service, and is equipped with Diesel electric propulsion.

ture atop the Atlantic Highlands at Navesink, New Jersey. Its penetrating beam measures 9,000,000 candlepower.

Progress, as well as nature's assaults, sometimes dooms fine old lighthouses. Often these towers figure prominently in local history and romance. Fortunately, such old towers sometimes can be preserved.

The State of New Jersey has taken over the tall tower of Barnegat Light, which is of diminished importance to navigation. The first Cape Henry tower, in Virginia, has been transferred to a patriotic organization (page 191), and that at Cape Florida is preserved by a private purchaser.

When the sea encroaches, it is often difficult to save an old station. Usually it is less expensive to move it, or to build another lighthouse.

Thus, along the low-lying, sandy south Atlantic States and Gulf coasts, many early masonry towers have succumbed to the sea. Metal structures have been dismantled and moved back to places of safety.

Ten years ago (1926) the historic lighthouse at Cape Henlopen, Delaware, was destroyed by the inroads of the Atlantic. Henlopen was one of the early Colonial lights, completed on a sand dune in 1767, and, for sentimental reasons, efforts were made to protect it. Its value to shipping, however, had been superseded by new lights and lightships.

Only this year it was decided to abandon the 66-year old Cape Hatteras Lighthouse, tallest tower in this service. Its site was originally two miles inland, but it is now within 100 feet of the surf. It has been replaced by a steel tower, set farther back from the sea.

LIGHT KEEPERS STILL ARE NEEDED

Our steady change to modern automatic lights has saved the public much money. But for primary lights the maxim is, "Safety is found only in certainty," and human attention, given by lightkeepers, must be retained. An exception is the lighthouse operated by the U. S. Government on Navassa Island in the West Indies.* Here the

* See "An Important New Guide for Shipping," by George R. Putnam, in the NATIONAL GEOGRAPHIC MAGAZINE for November, 1918.

keepers were removed because of difficulty in maintaining them on this uninhabited and barren island between Jamaica and Hispaniola. This lighthouse now has two automatic flashing lights, one above the other, with independent gas supplies for each, to insure that one light will always show.

Ingenious devices are utilized to save gas or electricity in burning the automatic lights. Sun valves, depending on the rate of expansion of different metals, are used to turn off the acetylene gas lights during the daytime.

Recently the light-sensitive cell has been employed to turn on and off automatic electric lights operated from batteries. This is a metallic disk which turns light energy directly into electric energy. The principle is familiar to the multitudes who have seen it operating the doors to the waiting room of the Pennsylvania Station in New York City.



Photograph by U. S. Lighthouse Service

HAWAII BOASTS THE LARGEST U. S. LIGHTHOUSE LENS

Makapuu Point Light Station, Oahu, is landfall for vessels approaching Hawaii from California. The huge glass, nine feet in diameter, is made up of perfectly cut curved prisms, and is nearly as tall as the tower of the lighthouse itself. The beacon perches atop a rocky headland 642 feet above the Pacific (see page 189).

The unattended flashing light at Molokini, Hawaiian Islands, burned without failure for nearly 20 years, flashing over 200,000,000 times. Two lighted buoys each have a record of burning nearly a year and a half on one charge of acetylene gas.

BREAKING UP THE WRECKING INDUSTRY

The wrecking industry, which long flourished on the Florida reefs, has now vanished—proof that modern lighthouses and navigation methods make shipping far more safe.

Recently the local courts vacated the wrecking and salvage rules, because it was said: "Such a point of efficiency has been reached in placing the many aids to navigation along the Florida reefs that the rules have become practically obsolete."

A hundred years ago a fleet of fifty wreckers was sustained by this industry and salvage profits were huge.

Boldness of the wreckers, and their casual attitude toward buoyage early in the last century, are shown by a remark in the annual report of the superintendent of Cape Fear Lighthouse, in January, 1821: "It may not be amiss to observe that the



Photograph from U. S. Lighthouse Service

OFF FOR AMERICA'S MOST FAMOUS WATCH POST

The new Nantucket Lightship *No. 112* leaves Wilmington, Delaware, to take up its station on the Nantucket Shoals. It replaced a relief ship rushed to this important outpost, 47 miles from the nearest land, when the original lightship was rammed and sunk by the liner *Olympic* during a dense fog in May, 1934. Many vessels have occupied this station since 1854. The new lightship embodies numerous improvements, including double sides, watertight compartments, and a radio antenna raised above the lanterns on the masts. Under the bow is a large mushroom anchor that is lowered when the ship takes its station on the shoals (page 176).

buoy which was placed at the end of Cape Lookout Shoals last summer came ashore in less than a fortnight, and some of the wreckers who live on the banks cut up the buoy and sold the copper and spikes in Beaufort, without asking leave of anybody."

AN UNUSUAL LIGHT IN HAWAII

Kaula, westerly island of the main Hawaiian group, lies 180 miles from Honolulu. A lofty, tablelike rocky islet, with an area of about 100 acres, it is uninhabited and almost barren (page 176). But bird colonies here are so dense that one can scarcely walk over its rounded summit without treading on eggs or nests. When steamers pass for Manila or other oriental ports, they often toot their whistles to arouse the birds, and thus amuse passengers.

To put a needed light on the crest of this islet, 550 feet high, was a task of singular hazard. Bronze handholds had to be grouted into the walls of overhanging cliffs so that workers might follow the only trail, which for some distance was within reach of the waves. A ladder and chain were added to aid the ascent, and a derrick was placed at a higher level for hoisting and lowering into the boat both cargo and workers.

But now the light burns, using acetylene gas, which is piped to the summit from a supply house high above the landing. To guard against failure of the automatic light, the installation is in duplicate and each gas supply will last more than a year.

Kaula lies in favorite fishing waters of the Hawaiian natives. They hold it in awe, for ancient tribal legends cling about it. On the northwest side of the rock is a cave, broad and high enough for a small schooner to enter. The Hawaiians say this cathedral-like cavern was the home of Kuhaimoana, deified king of all the sharks in the Hawaiian Islands.

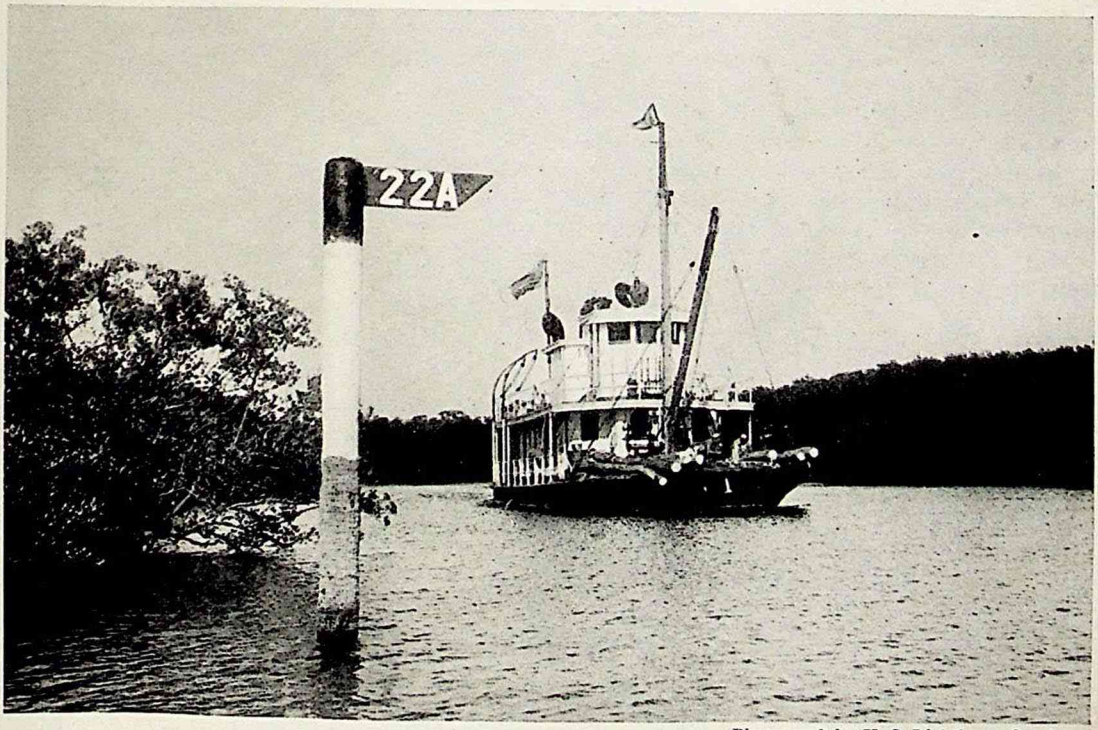
The old Hawaiian practice is to enter this cave and pray before fishing or



Photograph by Ralph C. Smith

LIKE A GIANT WATER SPIDER, FOWEY ROCKS LIGHT GUARDS THE FLORIDA REEFS

This station, near Miami, is the most northerly of six iron sentinels marking one of the Nation's busiest "water highways." A scale model of this tower, with light flashing, stands in the lobby of the new Department of Commerce Building in Washington, D. C.



Photograph by U. S. Lighthouse Service

PALMETTO PILES POINT THE WAY ON INLAND WATERS

Lighthouse tender *Althea* and a finger marker on the intracoastal waterway in Florida. The pile, driven into the soft bottom with a strong jet of water boring the hole, indicates by color and number on which side of the channel it stands (page 184).

landing; it is believed that evil will befall one if this is not done.

One Hawaiian member of the crew could not understand why no accidents befell this lighthouse group who had failed to offer their devotions. He finally concluded that the gods were satisfied because of the humanitarian purpose of the work!

RIVERS AND INLAND WATERWAYS ARE ALSO PROTECTED

Most people, thinking of lighthouses as standing by the sea, do not realize to what extent inland waterways are also marked.

The navigable waterways of no other continent can compare in extent and importance with those of North America, which comprise the St. Lawrence and the Great Lakes; the Mississippi River system; the Atlantic and Gulf intracoastal waterways; the Alaska inside channels, and such long river and bay approaches to great seaports as Delaware Bay, Chesapeake Bay, the Mississippi River Passes, and the Columbia. Many of these are marked for seagoing vessels, others for shallow-draft boats.

The Atlantic coast inland waterway, from Cape Cod to Key West, is about 1,900 miles in length, and is marked by 3,200 aids to navigation. The lower portion of this route, south from Norfolk, is a combination of natural channels and artificial cuts, and is a winding, picturesque passage.

The special type of beacon best adapted to the Florida waterway is a simple palmetto pile, sunk by water jet into the mud. The top of the pile carries a finger board pointing toward the channel (page 183).

With many vessels and tows going through the passages, which are often narrow and crooked, it is a busy job for the little lighthouse tender *Althea* to keep these markers in place. This interesting channel lures scores of private yachts to balmier climates in winter, and much commercial traffic moves over some sections of it.

NO LIGHTS IN MARK TWAIN'S TIME

The Mississippi River system includes about 4,500 miles of navigable waterways, and is marked by nearly 5,000 small lights and buoys. Its once heavy traffic developed and reached its zenith before the days of marking the channels. In 1874, when the first navigational lights were placed on the Mississippi, the river already carried 1,100 steamboats, besides other craft.

Mark Twain describes graphically the job of a young pilot "learning the river," and memorizing "the shape of the river in all the different ways that could be thought of."

He refers to piloting on "vast streams like the Mississippi and the Missouri, whose alluvial banks cave and change constantly, whose snags are always hunting up new quarters, whose sand bars are never at rest, whose channels are forever dodging and shirking, and whose obstructions must be confronted in all nights and all weathers without the aid of a single lighthouse or a single buoy, for there is neither light nor buoy to be found anywhere in all these thousands of miles of villainous river."

Years later, but still in the period of numerous steamboats, few lights and no buoys, the writer of this article, with two boy companions, made a canoe trip of 400 miles down the upper Mississippi.

Memory vividly recalls the difficulty steamboats had in some of the shallower crossings, the great spars carried to help hoist themselves over sand bars, and the numerous log and lumber rafts being slowly pushed down the river, each by a small stern-wheeler.

Lights on the lower Mississippi were maintained during the period of the great flood of 1927 under the most trying circumstances.* Near Natchez a keeper was driven from his house, which was flooded to the eaves; yet no matter how high the water got, he kept his light going. As the river rose, the lantern was raised several times by adding to its support. Homes in the vicinity were flooded to their roofs, and it is a mystery where the keepers found shelter.

The keeper of Windy Point Light, on Grand Lake, Louisiana, reported: "I am yet on the job, but the water has run me out of my house. I have the oil on some logs. I will stay out here. All is well."

After landfall is made by means of radio, lightships and lighthouses, buoys and smaller lights guide vessels into port.

When an incoming steamer reaches Ambrose Lightship, picks up the pilot and heads for New York, it soon passes between two large lighted buoys marking the actual entrance to Ambrose Channel. On the right side is a quick-flashing red light

* See "The Great Mississippi Flood of 1927," by Frederick Simpich, in the NATIONAL GEOGRAPHIC MAGAZINE for September, 1927.



Photograph courtesy The Washington Post

DUSTING IS A DAILY CHORE IN "LIGHTHOUSEKEEPING"

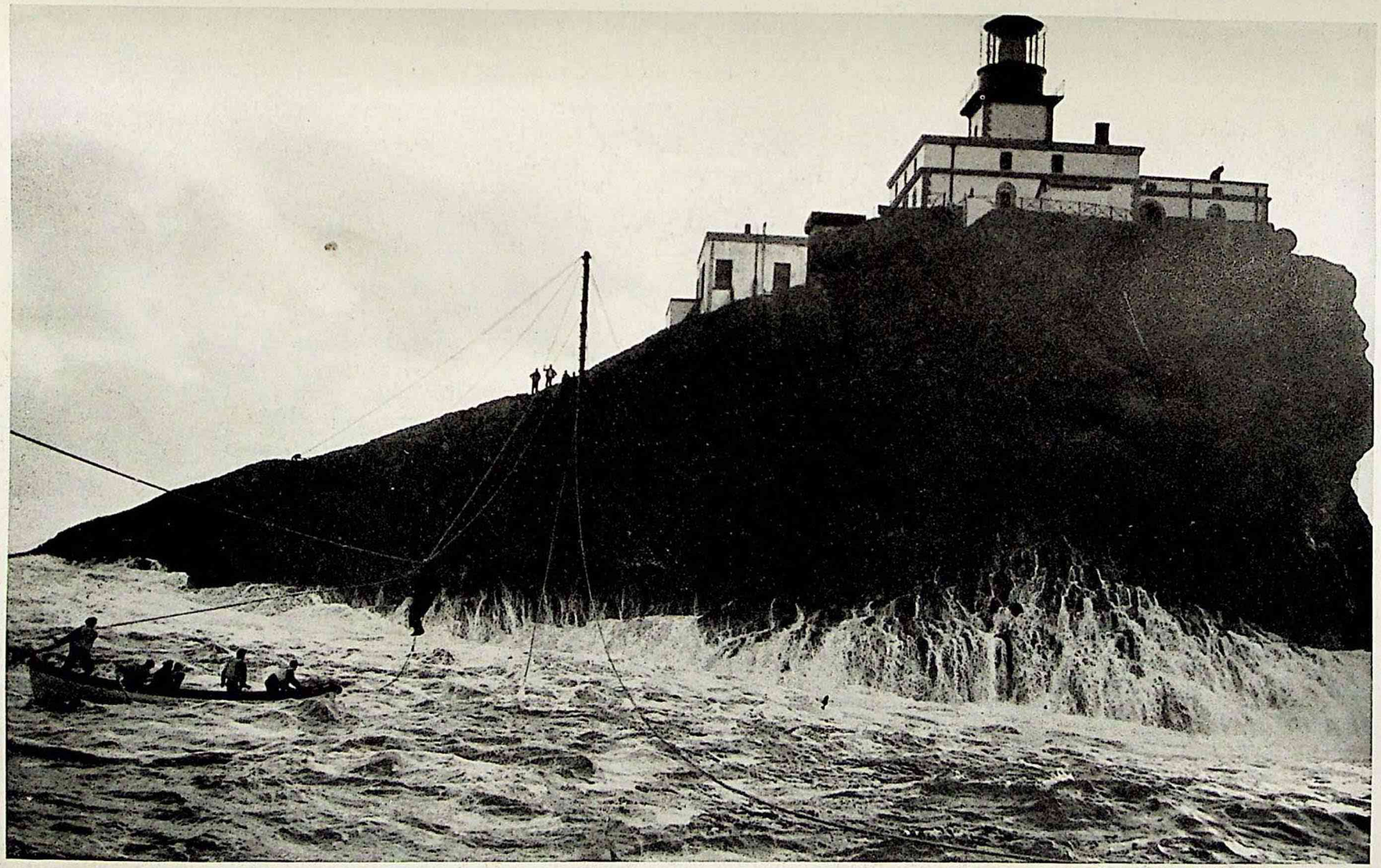
Four small bulbs are the sources of the dazzling shaft of light which the Cape Henry, Virginia, station throws 22 miles out to sea on a clear night to guide shipping into the entrance to Chesapeake Bay. A huge lens concentrates the light from the four lamps into a piercing white beam of some 160,000 candlepower. Cape Henry is one of the 116 primary lights of the U. S. Lighthouse Service (pages 191 and 195).



Photograph by U. S. Lighthouse Service

AS A SEAGULL MIGHT VIEW A NOTED BEACON

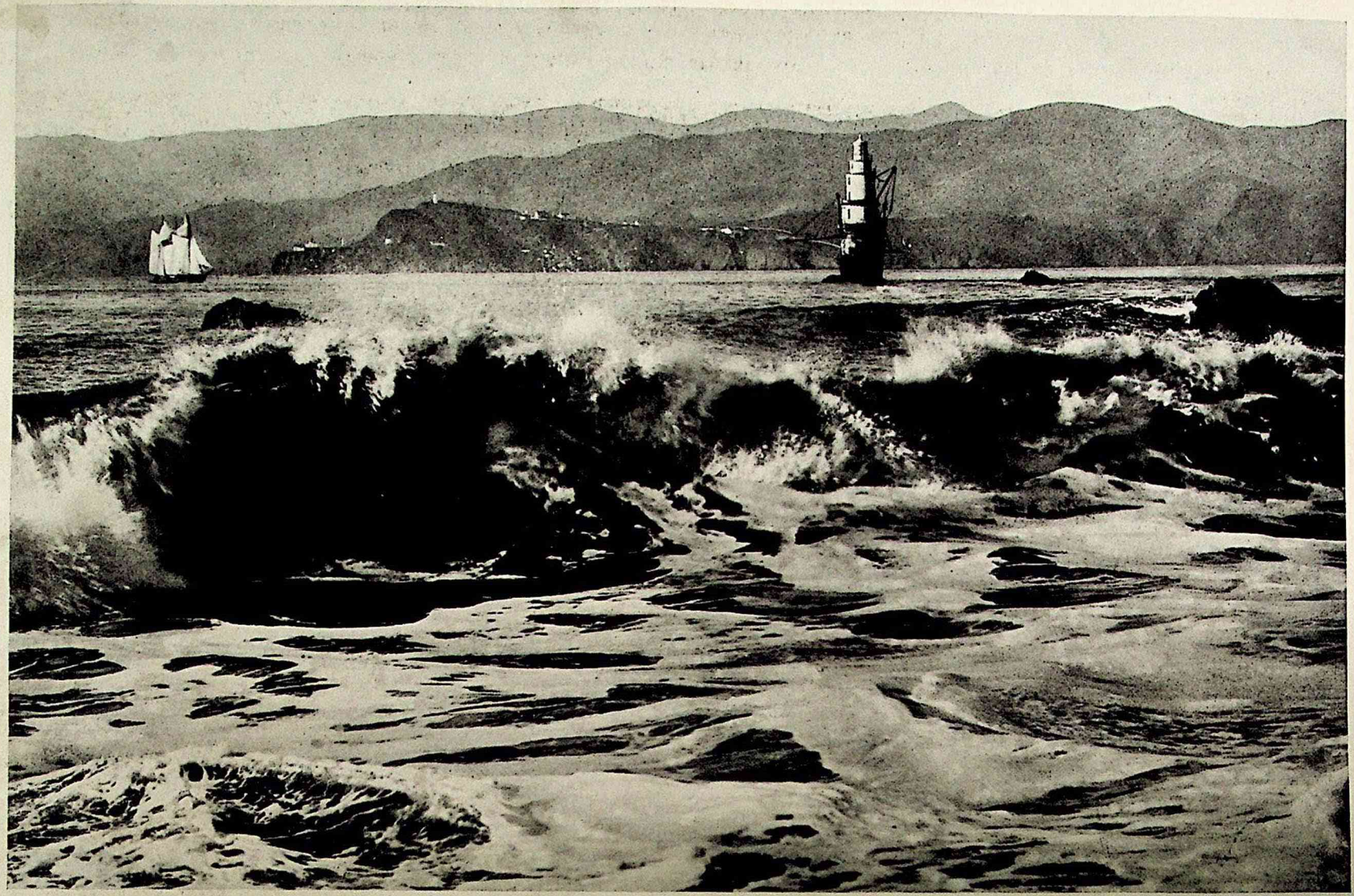
Boiling reefs and sunken ledges surround Minots Ledge Lighthouse, whose fame among mariners is perhaps second only to that of England's Eddystone. This light points the way to Boston Harbor. It must be provisioned and the crew relieved during periods of fair weather, for only then may small boats approach safely. When storm winds blow, mountainous waves from the open Atlantic dash far up its stout masonry sides.



Photograph by U. S. Lighthouse Service

FOR THRILLS APLENTY, GO ASHORE IN AN EMERGENCY AERIAL FERRY

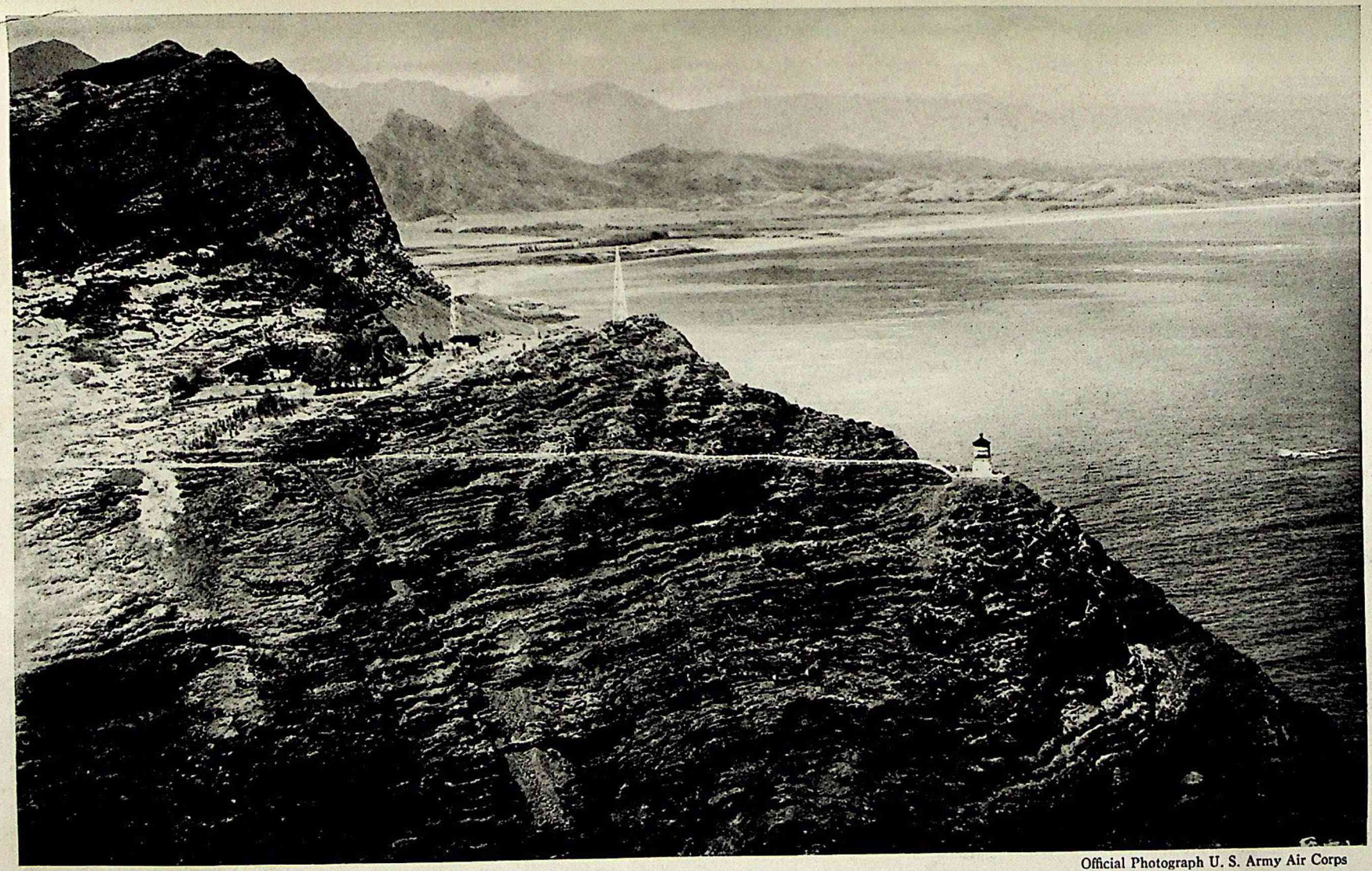
After the disastrous storm of October, 1934, a temporary landing gear and breeches buoy had to be employed to land workmen and relieve the keepers of the Tillamook Rock Lighthouse. This beacon stands on an isolated crag off the Oregon coast, south of the mouth of the Columbia River. During the four-day storm wave-tossed rocks broke sixteen panels of the plate-glass lantern, 133 feet above normal high water (page 198).



Photograph from Ralph C. Smith

CLOSE-HAULED AND BOUND IN, A SCHOONER APPROACHES MILE ROCKS LIGHT, A KEY TO THE GOLDEN GATE

At one of the narrowest points along the cliff-walled passageway between the Pacific Ocean and San Francisco Bay, this tapering shaft warns mariners of jagged black rocks that flank the north face of Point Lobos. Even on fair days this light is difficult of access for the tenders. In 1901 the steamship *Rio de Janeiro* ran aground near by in a dense fog and more than 100 lives were lost. In the distance is Point Bonita, with a companion tower.



Official Photograph U. S. Army Air Corps

HAWAII'S "OFFICIAL GREETER" FOR SHIPS AND PLANES IS THIS STUBBY TOWER PERCHED HUNDREDS OF FEET ABOVE THE PACIFIC

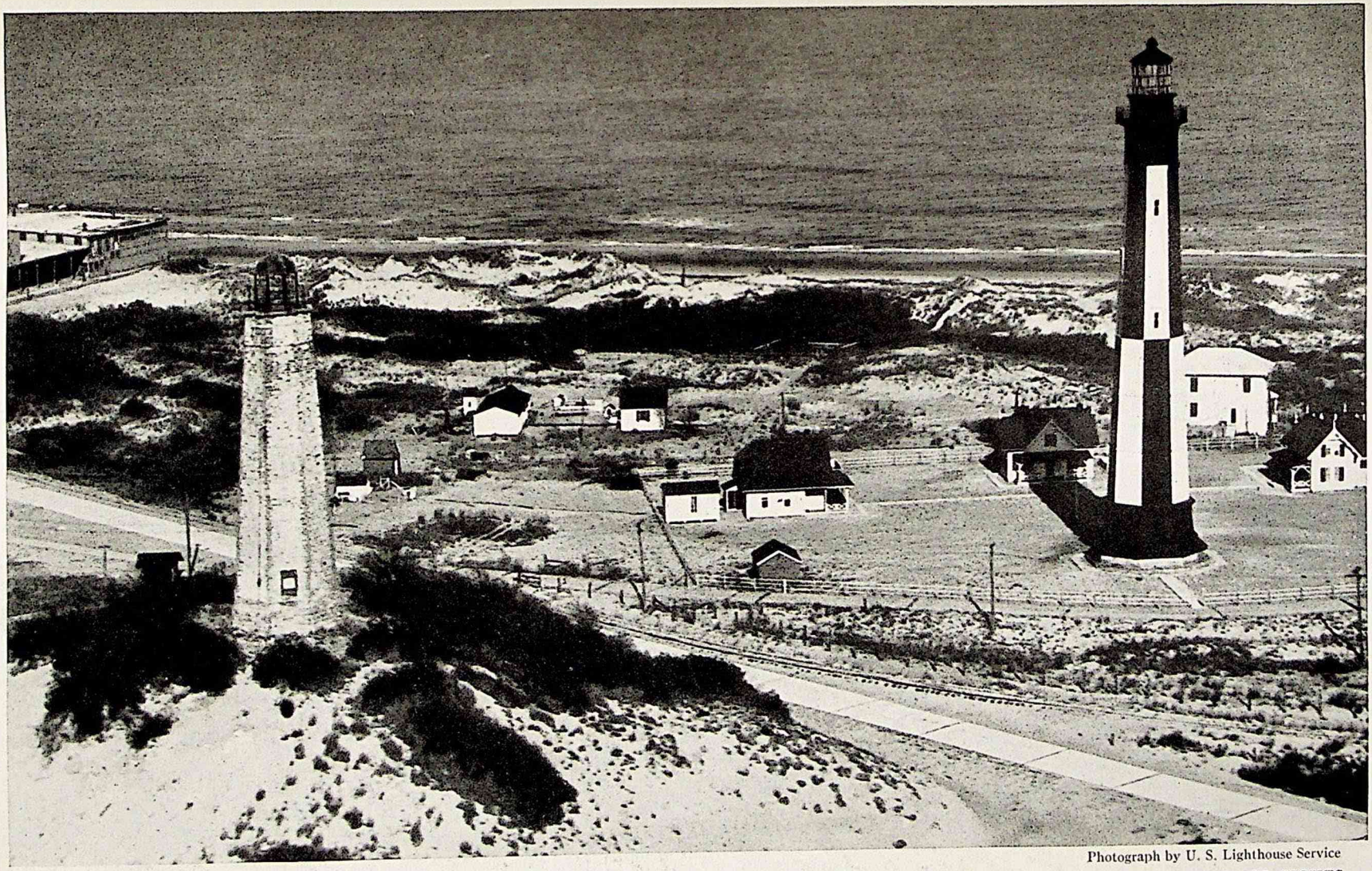
Both sea and air travelers from California on their way to Honolulu watch for the first flash of Makapuu Point Light. Its radiobeacon (towers, left center) has guided in many famous flyers and the Pan American trans-Pacific Clippers (page 181).



Photograph by H. S. Thorne

NEPTUNE'S RAGE—MONSTROUS WAVES THUNDER AND HISS IN THIS SPECTACULAR ASSAULT ON A STURDY ENGLISH LIGHT

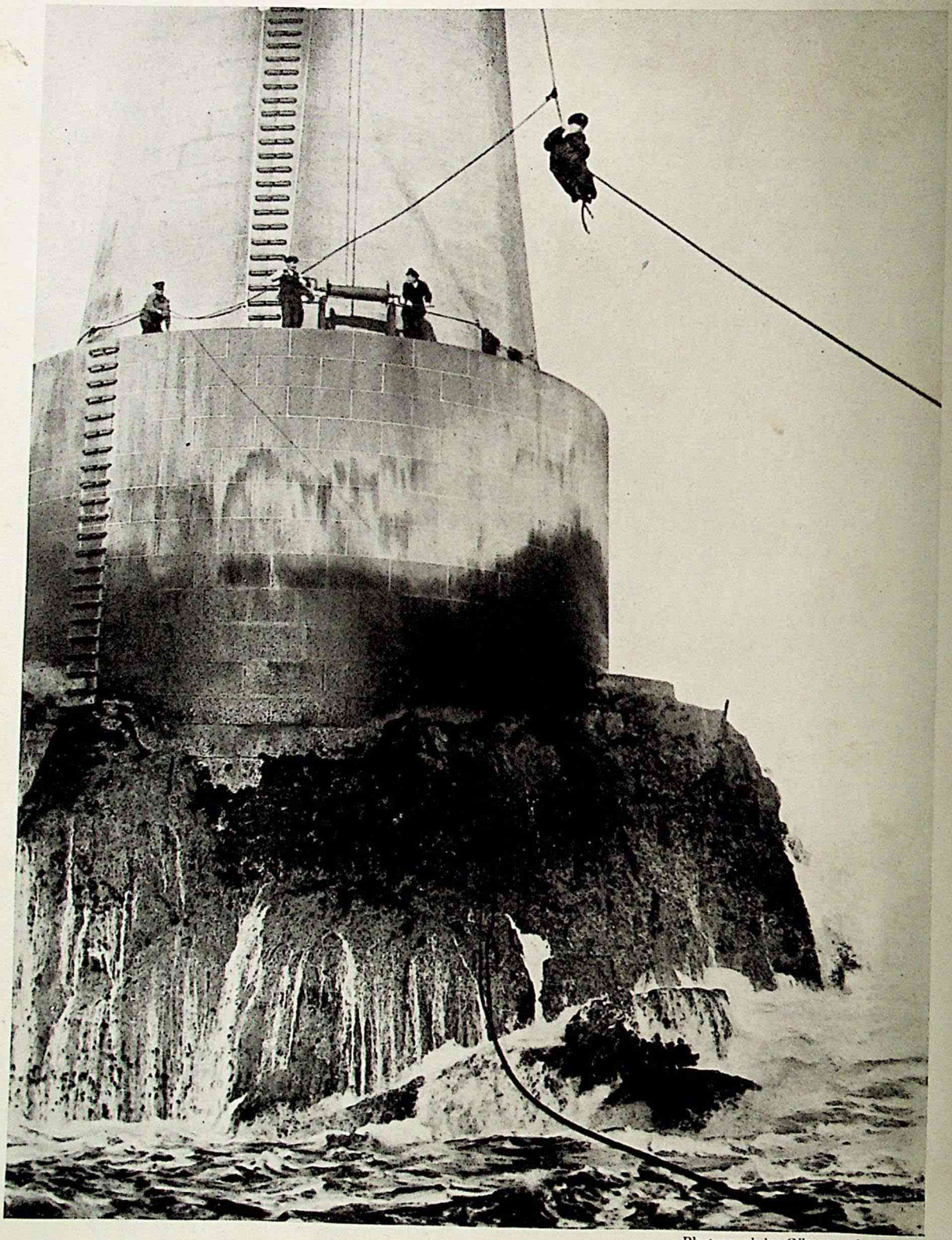
In the teeth of a severe northeaster, the North Pier Lighthouse, a half mile offshore, stands its ground against a surf that breaks to heights of 80 to 100 feet. Tynemouth is a seaside resort at the mouth of the River Tyne, near Newcastle.



Photograph by U. S. Lighthouse Service

MANY AN OLD-TIME FRIGATE, BALTIMORE TEA CLIPPER, OR SLEEK OCEAN LINER HAS MADE CHESAPEAKE BAY BY THESE HISTORIC LIGHTS

The masonry tower (left) guarded the southern cape of the entrance to Chesapeake Bay from 1792 to 1881. This was the first lighthouse built by the United States Government, the work being included in the first appropriation made by Congress for lighthouse purposes, on March 26, 1790. After 1881 the cast-iron structure (right) was put into service. The old tower is preserved by a patriotic society and is no longer used as an aid to navigation (pages 180, 185, and 195).



Photograph by Gibson and Sons

THE ONLY WAY ASHORE, FAIR WEATHER OR FOUL

At Bishop Rock Lighthouse, Scilly Islands, England, the ledge is so steep and the sea so turbulent that no boat can approach very close. Both lightkeepers and supplies must be hoisted by a rope suspended from a beam, and then hauled in by the winch on the platform 30 feet above the water. Although this picture was taken on a day when the sea was comparatively calm, ocean swells were breaking over the base rocks, as indicated by the water cascading off.

and bell, on the left a quick-flashing white light and whistle.

The ship then follows six miles of a dredged channel, 2,000 feet wide and 40 feet deep, lighted with frequent buoys on either side and special markings at turns.

Large liners, which formerly waited for the tide, now pass in and out of New York Harbor under all conditions but that of dense fog.

Along other coasts and at harbor entrances, buoys mark the sides of the channels as well as shoals, rocks, or wrecks. Their upkeep is an endless task for the fleet of lighthouse tenders, which constantly pick up and set out the buoys, restore them to their proper stations, bring them in for their annual overhaul, and supply the lighted buoys with tanks of compressed acetylene gas. This country now has over 1,640 lighted buoys, and a total of over 10,900 buoys of all types and sizes, not including the large number of reliefs.

Despite unceasing care, buoys sometimes break away in storms, are torn loose by passing vessels, or sink. Some have had strange adventures and to them poets have often ascribed human attributes. There is Kipling's poem, "The Bell Buoy," and Southey's "Inchcape Rock."

THE ADVENTURE OF A RUNAWAY BUOY

A strange story is that of the Frying-Pan Shoals Buoy 2A FP, which a few years ago broke from its moorings off the North Carolina coast and set out for the open sea. It was 40 feet long, weighed 12 tons, with light and whistle, and cost $8,000.

This runaway buoy drifted over into the Gulf Stream and sailed for Europe. Though sighted and reported many times, no vessel recovered it. Finally a French steamer saw it approaching the Irish coast and lighthouse authorities there were notified.

After 13 months at sea and a voyage of about 4,000 miles, 2A FP (the "FP" stands for "Frying-Pan") was washed ashore off Skibbereen, County Cork. That this buoy was an unusual guest on the Irish coast is quaintly told in the petition for reward made by John O'Sullivan:

"Myself and my assistant salvors seriously endangered our lives in the struggle to tow this buoy into port; hemp and manilla ropes to the value of at least ten Pounds have been destroyed while endeavouring to secure the buoy; for three weeks myself and my assistant salvors had to watch this buoy by day and night, to prevent it from being smashed against the rocks by the storm or again swept out to sea; due to the extraordinary weight and peculiar shape of this buoy, we have had an enormous amount of heavy manual labor in our efforts, as a result of which some of us are now suffering from pains in the back and aching limbs in general; the boots and clothing worn by myself and assistant salvors have been severely damaged by being ground and torn with the jagged rocks which surround the cove where this buoy is now moored."

The Irishmen were duly rewarded, the buoy brought home, and it is now again chained and shackled to its mooring, serving humanity on a station of our Atlantic coast.

Sounding its whistle day and night, another buoy broke away from near Nantucket Shoals Lightship, drifting 3,300 miles in 19 months, circling between Bermuda and the Atlantic coast.

TUGMEN IRATE AT "PORCUPINES"

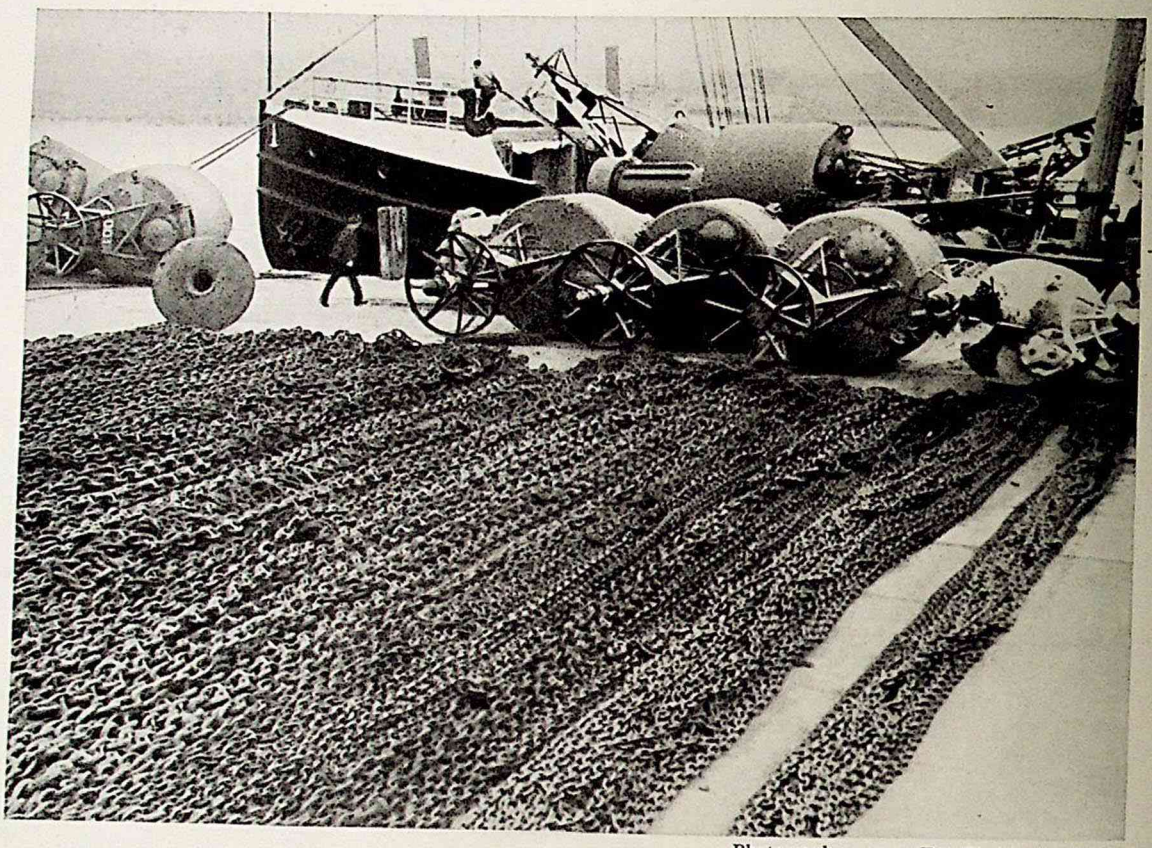
In some waters around New York, traffic is rough on buoys. Wooden spar buoys, formerly used, were sometimes cut down more than once in a single day. Now wooden spars have been replaced by light steel buoys, which can better resist collisions and the slashing of ships' propellers.

In areas below The Narrows, where tows of barges pass out to sea, it became necessary to protect the lighted buoys from the towlines by putting teeth or cutting-knives into the upper structure of the buoy. Strong was the language of irate tugmen when they discovered the purpose of this contraption, which one of them termed a "cussed porcupine buoy!" A towing hawser is a costly piece of equipment, and the sawteeth prove an effective cutting device!

All is now serene below The Narrows, and Ambrose Channel buoys are given a wide berth by the tug masters and their tows of scows.

Observe the buoys in a channel as your ship passes between them. You will note their different colors and shapes. On the right, as you come in from the sea, are red, cone-shaped buoys; and on the left are black, cylindrical ones. This uniform system of marking is in use throughout United States waters and in most of the world.

In North American, and some other waters, a red light shines from a red buoy



Photograph courtesy The Washington Post

HOME FROM THE SEA FOR REPAIRS

Periodically the floating light and bell buoys must be brought into the depots for cleaning and overhauling. Mooring chains also are examined carefully. Here about 1¾ miles of heavy chain of various sizes are spread out on the dock of the lighthouse depot at Portsmouth, Virginia, after being cleaned.

and always signifies the starboard side of the channel for the entering ship. The green light means the port side, while a white light may be on either side.

Just now a modification of this system is being introduced in this country, by which the rôle of a buoy is indicated by the character of its flashing light.

A quick flash, 75 flashes per minute, is cautionary, and designates a buoy requiring the particular attention of the navigator—such as a buoy marking an obstruction or danger, a turn in a channel, or a restricted entrance. Slow-flashing buoys (not over 30 flashes a minute) indicate the sides of channels. An interrupted quick flash signifies a wreck, and a short-long flash, a fairway or midchannel buoy.

This is an important advance, and will make buoyage more understandable and helpful to the navigator.

If a wreck occurs in an important waterway, it is extremely important to have it marked immediately, and the tenders make every effort to do this. A notable example was the sinking of the *Fort Victoria* in December, 1929, off the entrance to the New York Harbor channels. As soon as the fog would permit, the wreck was marked with a red bell buoy with red light at one end and a black whistle buoy with green light at the other.

FOG IS THE TERROR OF THE SEA

"Fog is the greatest enemy of navigation." Only recently, as explained on page 169, radio bearings have given the mariner for the first time a means of effective and accurate navigation in fog.

Though menace of collision still remains, the peril must diminish as approaching vessels in open waters make more use of radio bearings of each other, so as to pass clear.

But radio signals do not make it possible to dispense with whistle fog warnings.

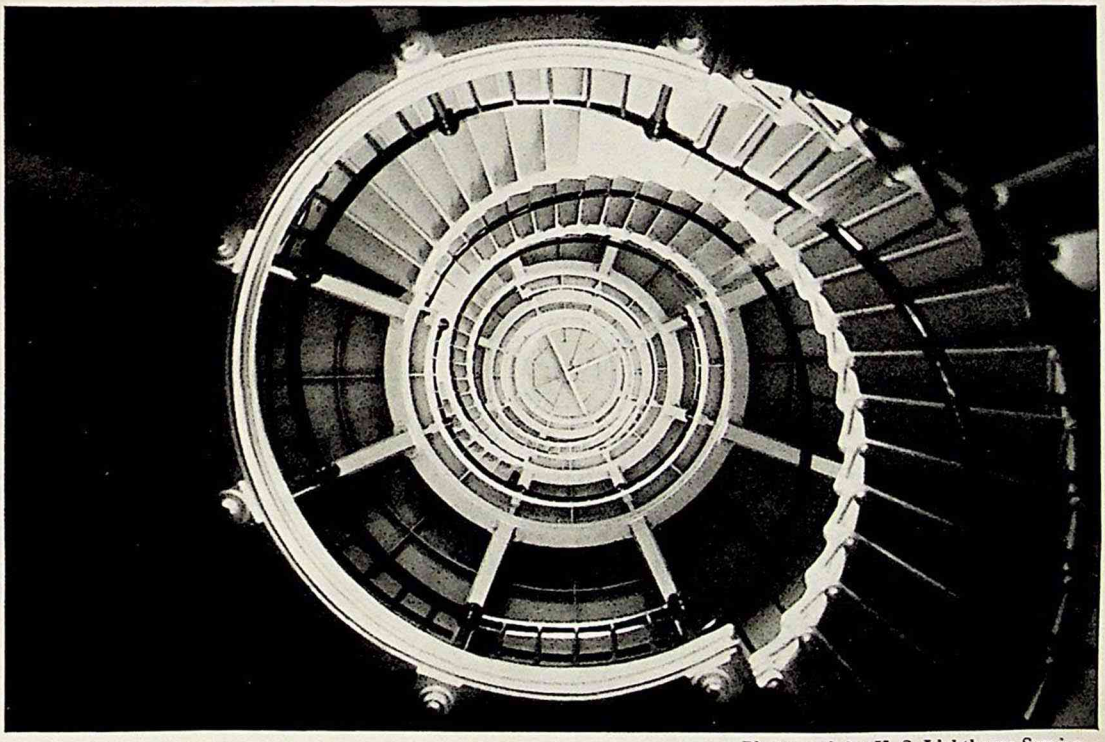
Often, however, the whistle signals, as



Photograph by Fred Samuelson

ALL BUT THE LIGHT ENCLOSED IN GLISTENING ICE

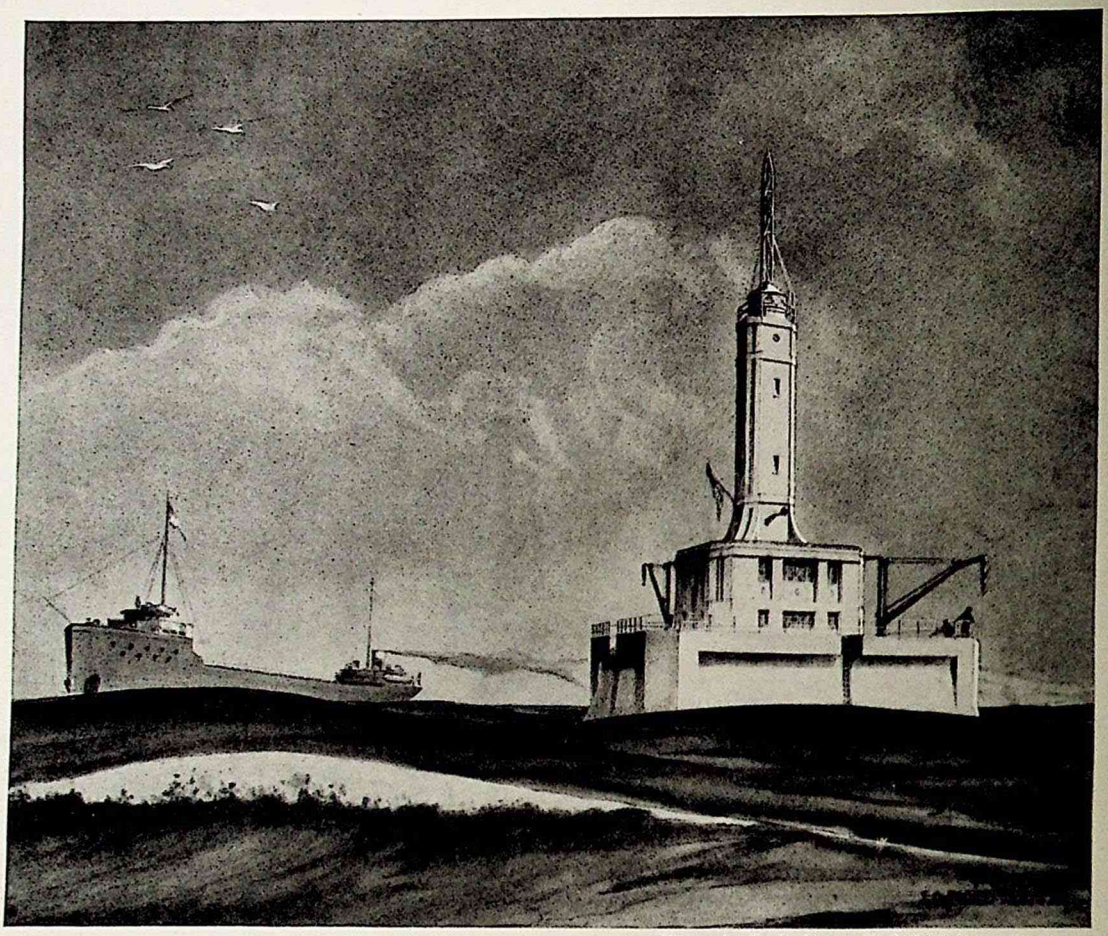
During heavy winter weather in 1918 the Ludington North Breakwater Light, marking a car ferry port on the east side of Lake Michigan, was almost put out of commission by frozen spray and ice. This station has a flashing electric light, a diaphone, and a radiobeacon.



Photograph by U. S. Lighthouse Service

A LIGHTHOUSE STAIRCASE, NOT THE INSIDE OF A CONCH SHELL

Lightkeepers get ample exercise in performing their duties. This unusual view, looking straight up the center of the 165-foot shaft of the present Cape Henry Lighthouse, shows the spiral staircase leading to the light and lens on top. Steps and tower are built of cast iron (pages 185, 191).



Drawn by R. E. Yates, U. S. Lighthouse Service

EVEN LIGHTHOUSES HAVE GONE MODERNISTIC

An architect's drawing of the new Grays Reef Lighthouse in Lake Michigan. This tower's diaphone fog signal and radiobeacon are synchronized so that a vessel may determine its distance away by noting the time it takes for the sound signal to travel through the air (page 170). One of six built with PWA funds, this reef station replaces a lightship.

now required, fail to give sufficient warning to prevent collision. A tragic example was the collision off the Massachusetts coast between the passenger steamer *Fairfax* and the oil tanker *Pinthus* in 1930, when 50 lives were lost.

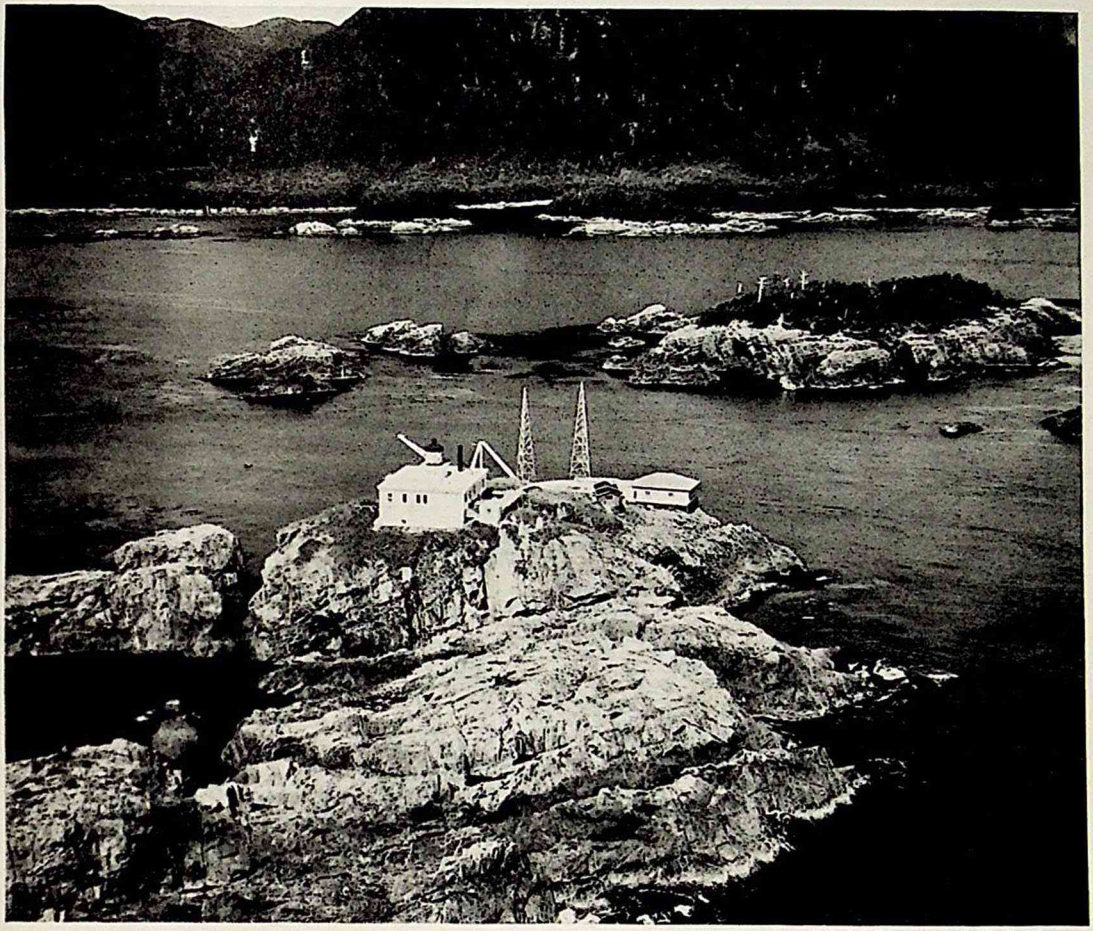
In this disaster the master of the *Fairfax* first heard the fog whistle at the same instant that he saw the bow of the tanker 150 feet away.

NONE SURVIVED TO TELL THE STORY

There was no survivor to report the story of the latter vessel. Surely we need some better means of preventing collision than a steam whistle, which may be drowned out by atmospheric conditions, and whose direction is only to be guessed at.

Here is a report received from the master of car ferry *P. M. 22* on Lake Michigan: "On December 19 when en route to Manitowoc, with strong west winds and winter fog so heavy I could not see the water from the bridge, I picked up the mobile radio signal of *P. M. 21* (a sister ship) nearly ahead. She was coming from Manitowoc. I ported one point. The bearings on our radiocompass constantly changed until I had steamer *21* abreast of me. We probably passed within a mile of each other. We did not see or hear her, but we knew by the bearing that we were going clear, and also when we had passed her. I consider it a perfect demonstration of the value of the mobile radiobeacon."

Low-power, warning radiobeacons have recently been tried out on several stations, in addition to the regular radiobeacons.



Official Photograph U. S. Navy

ITS RADIOBEACON SAFEGUARDS A HAZARDOUS ROUTE

The Cape Spencer Station, on a small, rocky island in the Pacific Ocean off Cape Spencer, and not far from Juneau, marks the principal entrance from the westward into the island-studded Inside Passage of southeastern Alaska. Radiobeacons are especially welcome to mariners sailing treacherous northern waters where fog and rain constantly blot out lights or muffle foghorns.

These warning signals have a distinctive warble note. They are intended to have a range of about 10 miles, and to give a distinct warning to approaching vessels that they are in the vicinity of a lightship or other station. Many reports have come in from navigators, and nearly all are favorable. These warning signals also extend the time for taking bearings.

UNSUNG RÔLE OF LIGHTHOUSE TENDERS

Tenders are used in lighthouse work for the care and supply of buoys, lightships, and lighthouses. A Secretary of Commerce once wrote, "This is a fleet of vessels whose duty it is to go where no other vessels are allowed to go, and who, through storm, darkness, and sunshine, do their work for humanity."

The first steam tenders were side-wheel vessels. The last of these went out of commission only a few years ago, after 50 years of service. This tender, the *Holly*, was a familiar sight in the waters of Chesapeake Bay and about Norfolk, which was her headquarters. President Cleveland sometimes used the *Holly* for short trips away from Washington.

The larger of the present-day tenders are able seagoing vessels, capable of lifting the heaviest sea buoys. Some of the latest ships have Diesel propulsion, and many are equipped for radio communication. These craft are small and of moderate speed. They are sturdily built for difficult work, which at times involves them in marine adventures calling for the highest seamanship and courage.

President Wilson once wrote a letter of commendation to the officers and crew of the tender *Columbine* for their heroic work in a Hawaiian Islands storm. They saved a bark, four times the size of the *Columbine,* disabled in the breakers off the coast of Kauai.

For a similar feat, in which he saved the crew of a patrol boat near San Juan Harbor, Puerto Rico, a gold medal was awarded Captain Manyon, of this same *Columbine,* which had in the meantime been brought around to the Atlantic.

Another time when a President recognized the courage of the officers and crew of a Lighthouse Service vessel was after the hurricane of September, 1933. In this storm the Diamond Shoal Lightship was driven from its station off Cape Hatteras.

The vessel dragged its 2½-ton anchor for five miles until it went into the breakers. Slipping the moorings, the master and crew, by bravery and good seamanship, saved the lightship by maneuvering it out of the breakers. President Roosevelt wrote a special letter of commendation.

STORMS WRECK LIGHTS AND BUOYS

The famous Tillamook Rock Light Station, off the Oregon coast, long battered by the Pacific, was subjected to another severe storm in October, 1934. Tremendous seas swept the rock, repeatedly submerging the entire station, although the light is 133 feet above normal high water. A section of the rock itself was torn away, and large fragments were thrown over the station. Sixteen panels of the heavy plate-glass lantern were shattered, rock fragments sixty pounds in weight being thrown inside (page 187).

The keepers, sometimes submerged to their necks, struggled to erect storm shutters. The storm raged for four days. During this time the keepers could not leave the building, but they managed to display a temporary light after the first night. Since telephone cable connection had been broken, an assistant keeper contrived a short-wave radio set and established contact with amateur radio operators ashore.

Notable work was done later by the master and crew of the lighthouse tender *Rose* in landing construction materials and relieving the men on the rock until repairs could be completed. That job required several months owing to protracted stormy weather.

When the story of the work of the keepers at Tillamook was published, the Chief of the Lighthouse Service of Mexico, Mr. Alberto J. Pawling, had it translated and sent to all the lightkeepers of Mexico as an example of courageous performance of duty.

A Lake Erie storm in January, 1928, so completely covered the Ashtabula, Ohio, Lighthouse with ice that two keepers were imprisoned. Two others, ashore during the storm, on their return found the light station incased in a solid mass of ice. To establish communication, the men inside had to thaw open the door and cut a trench with picks for a distance of nearly forty feet to reach the side of the crib.

Lights and buoys suffered severe damage in the winter storms of 1918. Buoyage in all bays and rivers from Massachusetts to North Carolina was completely disarranged, and inside lightships were repeatedly dragged from their stations by moving fields of ice (page 195).

Ambrose Channel was kept marked only by the continuous and strenuous work of the tenders; some of the buoys were replaced on their stations three times in one day.

Wide-spread destruction was wrought in Chesapeake Bay and the sounds of North Carolina, where upward of 125 lights were battered or destroyed. Practically the entire buoyage of the Hampton Roads and Norfolk areas was swept away. The total damage to aids, caused by this storm, was about $500,000.

Buoys, lightships, and lighthouses on our South Atlantic and Gulf coasts are often exposed to violent assaults when West Indian hurricanes blow. One such storm some years ago moved up the coast and damaged five lightships, three being driven off station. The master of Cape Charles Lightship reported various damage done to the ship, and said there had been 18 inches of water in the hold.

"I respectfully report that all the repairs we will do ourselves," he wrote. "There is nothing needed. The whistle was kept going for 14 hours during the gale."

A lightkeeper in Tampa Bay, reporting the condition of a damaged beacon, cheerfully added, "This structure is standing up from sheer good nature."

ANIMALS ALSO HELP

Like all sailors, men on the lightships and tenders often keep pets. "Sport" was a dog



Photograph by U. S. Lighthouse Service

"TAKING OFF THE KEEPERS" IS OFTEN AN ARDUOUS TASK

At the close of navigation on the Great Lakes, lightkeepers must be removed from offshore stations, and sometimes extreme difficulty is experienced if there is an early freeze. The tender *Marigold* stands by to receive the personnel of Raspberry Island Station in Lake Superior.

on the *Hyacinth,* which looks after Lake Michigan lights and buoys. Rescued from the lake, he spent his remaining twelve years on the tender, becoming "a member of the crew." He swam and played ball with the men. No boat could go ashore without Sport.

Many times he carried a heaving line to shore through the breakers when landing on the beach at some lighthouse. When he died, he was buried with the honors of the sea.

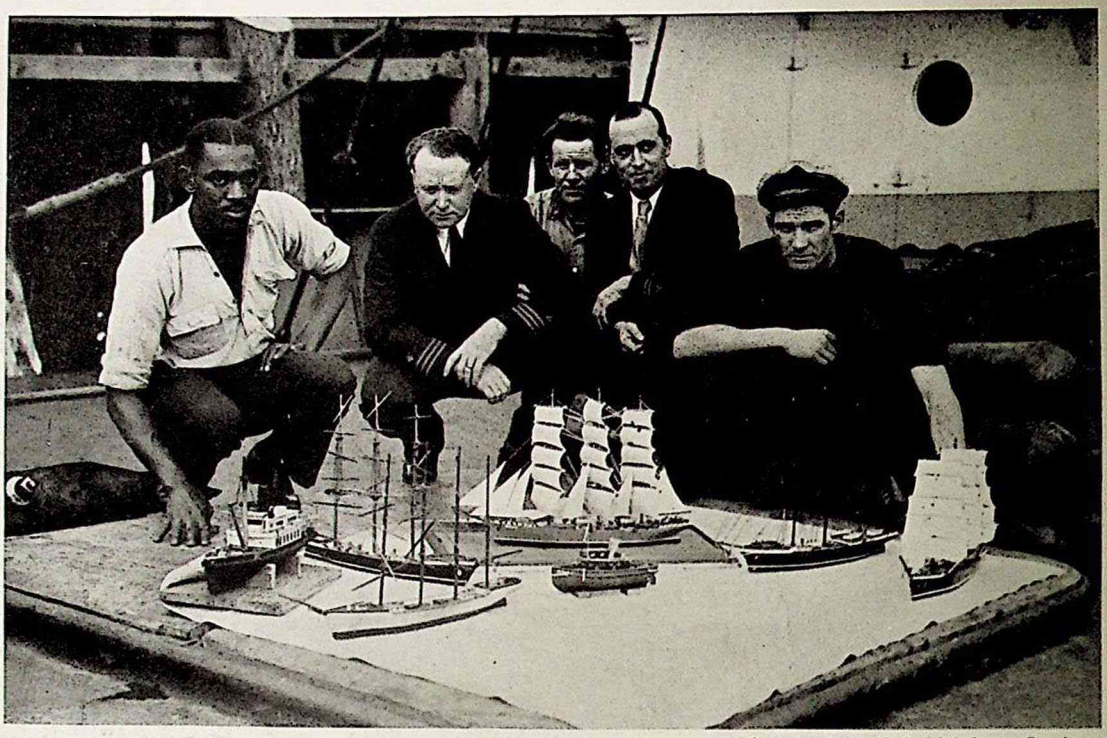
COAST LIGHTS ARE USEFUL TO OVERSEAS AIRCRAFT

On the Charleston Lightship the mascot was a cat, "Tom," of whom the master wrote: "Tom is eight years old. He was born on the old Charleston Lightship and knows no other home except our ship. He's one of our crew, and his regular job is to keep the ship free of rats."

Along the coasts all lights set up to guide vessels on the sea may, of course, be useful to airships, especially those from overseas. But since most air traffic now follows long straight inland routes, these must necessarily be marked by special airways beacons.

Powerful electric light beams, rapidly sweeping the skies like brilliant searchlights, are now familiar sights across the country. When within the range of ships on the sea or lakes, these lights are included in the mariners' list of lights, but this is done more to avoid confusion than because of their value in navigation.

Special radio beams, established for air navigation, are sent out in definite directions to mark definite routes. Marine



Photograph by U. S. Lighthouse Service

MODELMAKING WHILES AWAY LEISURE HOURS

Vessel crews and keepers in the Lighthouse Service find amusement in making miniatures of some of the craft they have seen. The crew of the tender *Iris*, including the cook, display examples of their handicraft, ranging from tugs to full-rigged sailing ships.

radiobeacons, on the other hand, are non-directional—that is, the signal is sent out around the whole horizon.

These marine signals may possibly be of considerable help to airmen in the future, when convenient direction-finders are available for airplanes, a development now being made. Lighter-than-air ships have long been so equipped, as was the *Norge* on her transpolar flight in 1926.

Some of the equipment, particularly the powerful double lens, developed by lighthouse engineers in marking inland commercial airways has been found applicable to certain marine lighting problems.

Twenty-three years ago, THE GEOGRAPHIC published an article by me on our lighthouse system.* Since then the wall of fog — thought impenetrable — has been pierced by radio signals.

Progress in the fields of electricity, optics, acoustics, and mechanics, and especially the radiobeacon and the lighted buoy, have since broadened the efficiency of guiding signals.

The effectiveness of the signal system has been extended to every hour of the year, and its whole frontier has, by radio, been pushed far out over the bordering seas.

* See "Beacons of the Sea: Lighting the Coasts of the United States," by George R. Putnam, in the NATIONAL GEOGRAPHIC MAGAZINE for January, 1913.

INDEX FOR JANUARY-JUNE, 1936, VOLUME READY

Index for Volume LXIX (January-June, 1936) of the National Geographic Magazine will be mailed upon request to members who bind their copies as works of reference.



Photograph by Francis C. Fuerst

UNLADYLIKE SHOES BETRAY A MASKED QUEEN OF THE CARNIVAL

Every third year, just before the beginning of Lent, the residents of Imst, in the mountainous Austrian Tyrol, hold a masquerade fete called the *Schemenlaufen* (Dance of the Phantoms). During this period, Winter and Spring are supposed to fight for the domination of Nature. Only men may act in the traditional festival, which is held to frighten away the accumulated evil spirits of the winter and to promote abundant crops and prosperity during the coming year.





Photographs by Francis C. Fuerst

BEFORE AND AFTER! HAVING EXCHANGED HER BROOM FOR A BURRO, THE WITCH-MOTHER GLOWERS AT ONLOOKERS

In ancient times the people of Imst believed that such grotesque figures caused evil winter weather and controlled the fertility of Nature and Man. Witch masks, carved from wood, are painted as ugly as possible, with goggle eyes, fanglike teeth, and pigs' bristles for beards. By wearing the masks, the participants in the festival are supposed to assume the powers of the demons.



EACH ACTOR TAKES A TRADITIONAL PART

With his syringe, the *Spritzer* (Sprayer), in the center of the trio, keeps back spectators by squirting water on them. His comrades are a witch and a *Sackner* (Sack Holder), with pointed hat, who carries a sack full of corn to throw at the feet of spectators.



Photographs by Francis C. Fuerst

A GOOD SPIRIT TAKES OFF HIS "FACE" AND CARRIES IT!

He may use the broom in his left hand to sweep away a devil or two! Above the mask with girlish features is a crown of flowers, which symbolizes the abundance of spring. On the broom handle are large pretzels, popular carnival fare.



FRIGHTSOME MASKS AND JANGLING BELLS PUT EVIL SPIRITS TO FLIGHT

On Gurgl Glacier, not far from Imst, Professor Auguste Piccard landed in his balloon after his first successful ascension in 1931. See "Ballooning in the Stratosphere," in THE GEOGRAPHIC for March, 1933.



Photographs by Francis C. Fuerst

THE LEG OF A ROE WRAPPED IN RUGS IS THE WITCH'S "BABY"

Most maskers dance, sing and shout, but some have special responsibilities. This hideous character throws her baby-in-effigy at favored women and girls, retrieving it with a string. The ceremony is supposed to insure fertility.



NOT DIRT, BUT DEVILS, IS THE "REFUSE" THEY SWEEP AWAY

In the Tyrol, broom-riding hags step from the pages of legend to the village streets. These witches' masks are adorned with feathers. The beard of one is the face of an angel whose wings form the sideburns.



Photographs by Francis C. Fuerst

A BUXOM HEX IS THE DEVIL'S BRIDE—AND PROUD OF IT!

Grotesque though the masks may be, they usually reflect a spirit of fun and playfulness. Imst is a prosperous town, for neighboring slopes and valleys yield rich harvests and many canaries are raised by the villagers to be sent to England and Turkey.



CARICATURE AND IRONY ADD ZEST TO THE FESTIVAL

Local customs and individuals are often satirized. This get-up is a travesty of a "happy couple."



Photographs by Francis C. Fuerst

IS HE FRIEND OR FOE?

The youngster is puzzled as he views the gaily clad masker, who is carrying his face in the illustration on page 203.



WRINKLES, BROOM, AND STRINGY HAIR—BEWARE THE WITCH!

Evil spirits are most easily repelled by mimicking their appearance! Male impersonators borrow laced bodices and many-plaited skirts from their wives, who may watch the ceremonies but may not participate.



Photographs by Francis C. Fuerst

THIS JOVIAL SORCERER MAY BE ADMIRAL OF THE DEVIL'S NAVY

A striped candylike stick serves for his magic sceptre. Perhaps the bird on top indicates that in real life he raises canaries. Known as the "city of the old fountains," Imst nestles in a valley on the southern slopes of the Lechtaler Alps.



Photograph by Francis C. Fuerst

RING OUT THE WINTER, ROLL IN THE SPRING

Evil winter spirits must flee from noise. As the dancers eddy through the squares of Imst, they contort their bodies continuously to jangle their bells. Most popular and numerous of the carnival characters are the *Scheller* (Bell Ringers) and the Rollers, who always appear in pairs. They symbolize the battle between the Good and Bad Spirits.

SEA CREATURES OF OUR ATLANTIC SHORES

By Roy Waldo Miner*

Author of "Coral Castle Builders of Tropic Seas," in the National Geographic Magazine

AS WE STAND on the seashore at the full of the tide and look out over the swelling floods surging in from the distant horizon, our feet are on the threshold of an enormous empire, so vast in extent and population that the achievements of the haughtiest rulers of mankind are dwarfed by comparison.

Though fleets sail over its depths, they make no significant impression upon this immense realm.

FROM THE SEA CAME ALL LIFE

The subjects of this empire swarm through the waters in myriads totaling far greater numbers than all the life of the continental world. In fact, scientific investigations indicate that the oceans were the original abode of life on the globe, and that the continents were peopled from that inexhaustible reservoir.

Geologists believe that the depressions now occupied by the oceans always have been located in approximately their present positions during the entire history of the earth, and that the foundations of the land masses likewise have been situated nearly as they are at the present time.

But during the great geological periods, the ocean has repeatedly invaded their edges and even their interior basins, sometimes to an enormous extent, forming shallow epicontinental seas.

Thus, all the continents of the world are bordered by a strip of shallow sea, the continental shelf, which slopes gradually from the coast to depths varying from 100 to 1,000 fathoms at its outer edge. Beyond this limit there is usually a more rapid gradient to the main floor of the ocean—the continental slope.

This world-wide shallow strip is of major importance to the life of the seas.

The present article deals especially with the mollusks and other small creatures inhabiting the continental shelf which borders the Atlantic coast of North America from Nova Scotia to New York, and includes the extensive New England fisheries. In a later article a contrast will be drawn between this life of northern waters and that of the warmer seas of the southern Atlantic coast.

A most remarkable stretch of shore this is. Its southern half is of comparatively even contour, but, beginning with the region of Cape Hatteras, the coast to the northward has subsided and is indented with deep bays and irregularities, finally terminating in the long curving and tapering indentation of the Gulf of Maine.

The latter is the most noteworthy feature of the coast, its wide mouth being guarded on either hand by Cape Cod and Cape Sable, and its inner reaches narrowing to a double apex in the Bay of Fundy (map, page 212).

All this northern half of the Atlantic seaboard is a succession of drowned valleys, and its topography and geological history indicate that it has subsided beneath the waves of the sea during relatively recent times. On the other hand, the even outline of the coast from Hatteras south to Florida shows no evidence of such sinking.

The oceanic shelf to the 100-fathom line widens rapidly to the northward, reaching its greatest extent off the Gulf of Maine, where it is approximately 400 miles wide.

The central floor of the Gulf of Maine is an ancient river valley to which the river systems, represented by those now existent, contributed their drainage, to be emptied into the prehistoric sea by a single channel and mouth still traceable on the sea floor at the edge of the continental shelf.

"SHELF" LADEN WITH SEAFOOD

Throughout this extensive and comparatively shallow oceanic margin, well illuminated by the sun's rays, conditions are favorable for an enormous development of the marine plants on which sea animals feed: namely, the microscopic diatoms, one-celled algae, and the larger seaweeds.

Here numerous streams empty their loads of silt, rich in nitrates, phosphates, and other chemicals needed for plant food. The strong tides rushing into the narrowing channel from the open sea keep the water stirred with upwelling currents plentifully supplied with oxygen.

Hordes of small crustaceans, the copepods, feed upon this plant life. At certain

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Photograph by Mary C. Dickerson

MUD SNAILS AND PERIWINKLES LEAVE "FOOTPRINTS ON THE SANDS" AT WOODS HOLE, MASSACHUSETTS

Silt mingles with sand in sheltered coves or behind sand bars, and the mixture contains food for burrowing creatures. Bits of dead matter attract mud snails, here trailing across the sand ripples left by an ebb tide. Periwinkles rest on the rocks in the lower left corner (page 213).

seasons they swarm in these waters in numbers so vast that they give the sea a reddish color for miles.

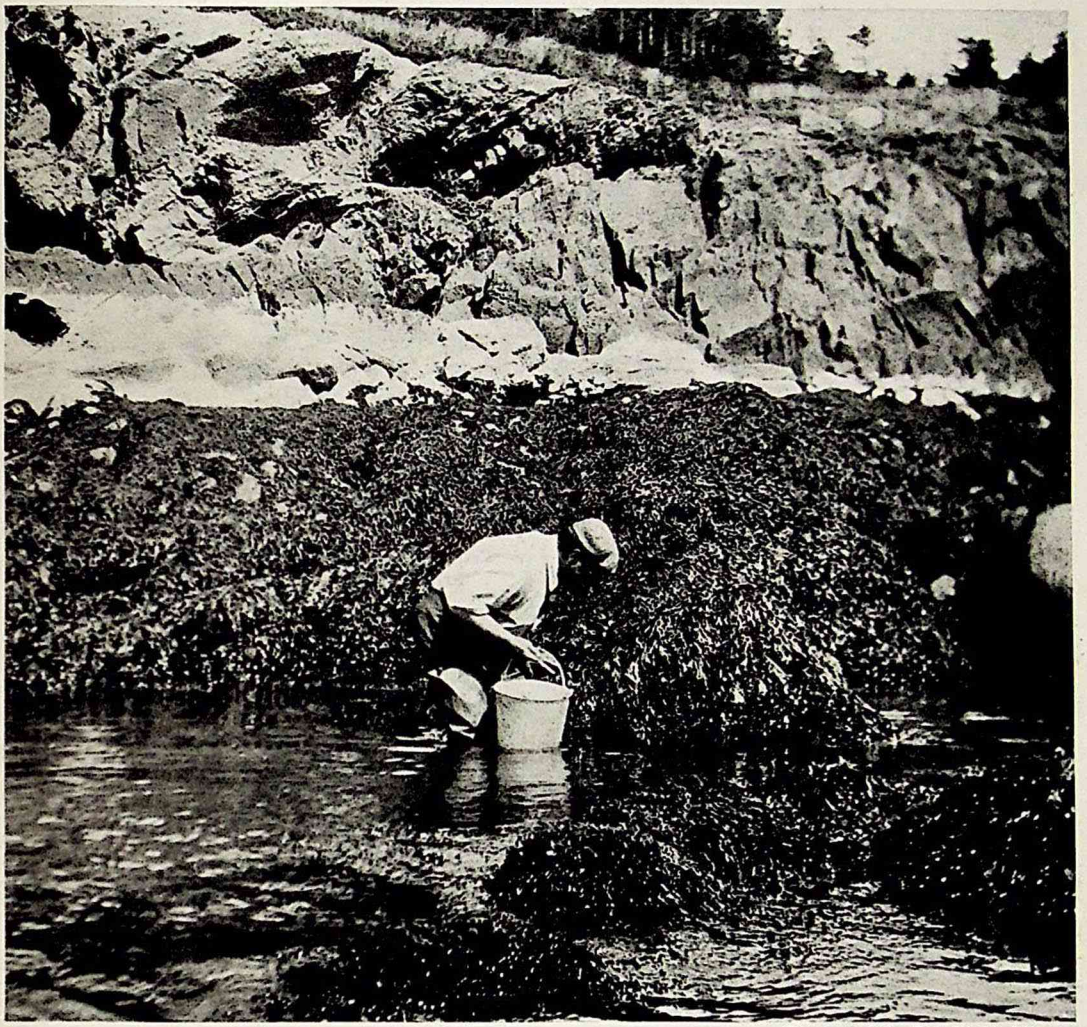
DEVOURING AND DEVOURED IN TURN

These tiny creatures are rich in oils and are greedily devoured by large schools of mackerel, herring, alewives, and shad. Bluefish, cod, hake, and haddock pursue and devour the smaller fishes, and even the huge finback and humpback whales do not disdain to feed upon the herring.

Thus the shallow banks off New England, especially Georges and Browns Banks, at the entrance to the Gulf of Maine, as well as the Grand Banks of Newfoundland, farther away, form a veritable nursery for the important food fishes of our coasts, and thus connect mankind by an interlacing food chain with the microscopic plant life of these shallow waters.

The evolution of the animal world, as we know it, would have been impossible had these primitive plants not come into existence. From such forms, also, all the higher land plants of the world originate.

Countless invertebrates besides the copepods feed upon the microscopic plant life, and in turn fall prey to other larger or more voracious invertebrates, while the latter



Photograph by Roy Waldo Miner

A COLLECTOR SETS TO WORK IN THE TIDAL ZONE AT BLISS ISLAND, PASSAMAQUODDY BAY

Precipitous shores here have a tidal rise and fall of 22 feet. Sleeves uprolled, the naturalist wades along a submerged ledge at about three-quarters tide. The zonelike arrangement of animal life is clearly shown here. A band of barnacles edges the high-water mark, and thickly matted rockweed covers the cliff below. Underneath the weed many sea animals cling in crevices, kept moist by the over-draping growth.

are hunted by the fishes. Thus a mighty struggle for existence has taken place in these shallow waters over the ages.

Many forms, such as the mollusks, have evolved hard protective shells. Still others hide themselves in submarine burrows, as do the marine worms. Many species, such as the jellyfishes, have become adapted for floating in the open seas and are borne away by ocean currents to less closely contested parts of the waters.

Some bottom creatures have crept down the oceanic slope, apparently crowded from its well-lighted summit by the teeming armies struggling for a place in the sun. Such forms have gradually accustomed themselves to life in dimmer waters, and among them a still lesser number of species have ventured down into the great abysses to live their lives in the Stygian darkness, the perpetual cold, and the enormous pressures of the deeps, miles below the surface.

As the open seas were peopled from the oceanic shelf, so the fresh-water streams and swamps received parts of the overflow. Countless species found food and a measure of safety from enemies by creeping into the area between the tides, where they



Drawn by Charles E. Riddiford

BORDERING THE EAST COAST IS A SHELF OF SHALLOW WATER, HOME OF MANY TINY SEA CREATURES AND SOURCE OF A RICH FISHING INDUSTRY

Strangely, the heavy dotted line (upper left), marking the Appalachian Mountains, and the 100-fathom curve in the ocean run roughly parallel, about 400 miles apart. North and eastward from New York the 100-fathom mark marches far out to sea and the mountain line comes down close to the water's edge in the Bay of Fundy, where rocky cliffs rise from drowned valleys. Southward this undersea plateau is narrow, but the coastal plain is quite broad. Where the shelf is widest, there lie Georges and Browns Banks, fertile fishing grounds for Nova Scotia and New England fleets. Cod, mackerel, shad, haddock, and many other commercial fishes feed on the tiny sea life which thrives there, and lobsters, clams, crabs, and oysters flourish in the coastal waters. Indentations in the 100-fathom line indicate deep gorges in the ocean's bed which are submerged mouths of ancient rivers (page 209).

acquired resistance to exposure to the open air at the intervals of low water. Here a rapid evolution took place, so that the intertidal zone became densely populated with life.

Finally, from fresh-water swamps on the one hand and from the upper parts of the marine tidal zone on the other, first plants and then animals invaded the land itself and produced the highly specialized types that now reign over it.

ANIMALS OF ROCKY SHORES

North of Cape Cod, the coast of New England is predominantly high and rocky. Beginning with the headlands of Nahant, Marblehead, and Cape Ann, north of Boston, the cliffs are at first isolated to local regions, with intervening stretches of sandy beaches and flats. But from Portland, in Casco Bay, northward, the coast is an almost unbroken succession of granite cliffs, sloping rock-ribbed promontories, and reëntrant bays and harbors, with occasional beaches.

The tidal waters flowing from the open sea are gradually confined by the narrowing outline of the Gulf of Maine, which forces them to a progressively increasing height, and reach a climax in the Bay of Fundy. From Massachusetts Bay north to Portland, the tide rises nine feet. It continues to increase northward, until it becomes 18 feet at Eastport and 37 to 48 feet at the ends of the two tapering horns which terminate the Bay of Fundy.

Here, too, there are interpolated stretches of beaches, flat points, and swampy meadows, and these are entirely covered at high tide. Naturally the width of the tidal zone on the side of a vertical cliff is measured exactly by the vertical rise and fall of the water. For example, the cliffs that surround Bliss Island, at the entrance of Passamaquoddy Bay, are exposed for 22 feet from the top of the barnacle frieze that marks the high-tide limit to the water level at low tide.

This region between the tides is teeming with life, both plant and animal, in crowded array. On the vertical granite walls of Bliss Island, the various species are arranged in overlapping zones, with the conspicuous white band of rock barnacles (*Balanus balanoides*) at the top (page 211).

Below this, the rockweeds (*Fucus vesiculosus* and *Ascophyllum nodosum*) hang in thick, gracefully festooned clusters down to the low-water mark and below.

Concealed beneath the rockweed, and succeeding the base of the barnacle zone, the rocks are covered with a dense layer of young black mussels (*Mytilus edulis*).

Among them (Plate II) are closely crowded groups of the common dog whelk (*Thais lapillus*), feeding upon the mussels, and laying their graceful vase-shaped egg cases, tinted rose and yellow, in mosaic-like patches in the crevices.

The latter mollusks secrete a purple dye, formerly used by the Indians for coloring their deerskin garments. They are related to the *Murex* of the Phoenicians, from which that people derived the famous royal purple, later arrogated by the Roman emperors for their personal use.

The dog whelk has a thick shell with a characteristic spindle-shaped opening. It is extremely variable in color, size, and sculpture along the New England shore.

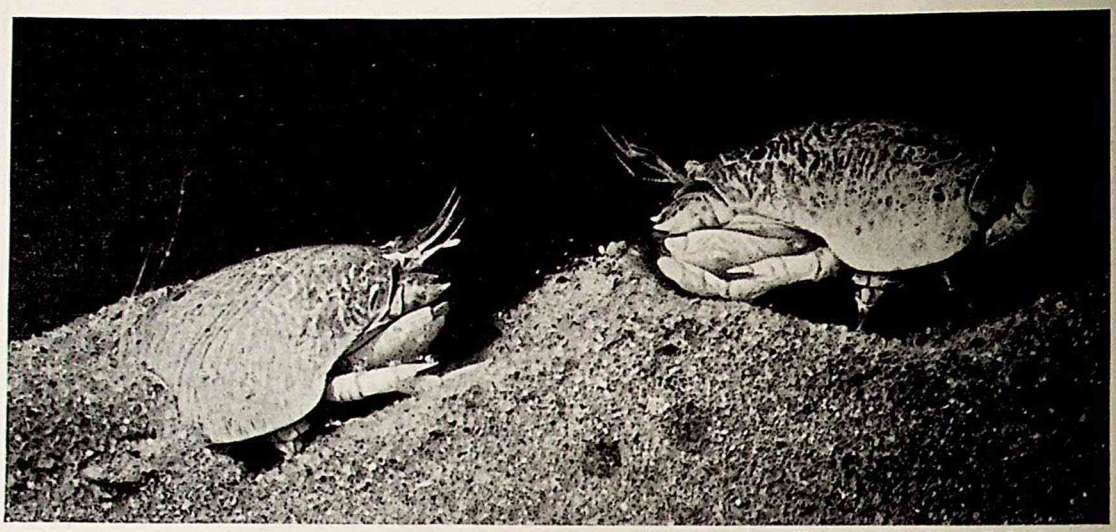
The common periwinkle (*Littorina littorea*) creeps everywhere over the rockweed from the low-water mark to the highest part of the barnacle zone and even upon the bare rocks far above it (page 210). This remarkable sea snail can stand exposure to the open air longer than any other marine creature of the northern coast, except perhaps the closely related black acorn shell (*Littorina rudis*).

It is in a transitional state of evolution toward terrestrial life, for its gill seems to be on the point of being replaced by a lung. It has a very wide range, being found on both sides of the Atlantic. In England it is the common "winkle" sold in markets.

A zone of kelp occurs at the low-water mark, anchored to the rocks by hold-fasts, the long, slender stems terminating in brown ruffled fronds which float out into the water, sometimes for ten or twenty feet. These are the "devil's apron string" (*Laminaria agardhii*).

SOUPS AND JELLIES FROM THE SEA

Below the kelps, and entirely submerged except at the lowest spring tides, is the zone of red seaweeds, of which the commonest and most conspicuous are the dulse (*Rhodymenia palmata*), consisting of thin, hand-like expansions of a red, rubberlike consistency; and the Irish moss (*Chondrus crispus*), a beautiful, finely divided alga, which shades from green to red in sunny places, or a deep red or chocolate brown, with brilliantly iridescent violet tips, in more shaded localities.



Photograph by Mary C. Dickerson

MOLE SHRIMPS SEEM TO SAY, "LET'S SEE WHO CAN BE FIRST UNDER COVER!"

These little animals burrow in loose beach sand at the surf's edge. Often washed out by storms in countless numbers, they immediately dig in again. Their shells are yellowish, tinged with purple. The creatures, here magnified about one and one-third times, are especially abundant along the south shore of Long Island (page 225).

Dulse is sold in markets for soup stock, and Irish moss is important commercially in the dry state for manufacture of jelly compounds, well known to housewives.

The zonal arrangement of the animal associations continues to the low-water mark. The mussels, overlapped by the seaweeds above mentioned, extend downward until limited by the broad and continuous band of the green sea urchin, which rejoices in the longest scientific name known to zoologists, *Strongylocentrotus droehbachiensis!*

This little animal feeds so voraciously upon the mussels at the lower edge of their distribution that they are abruptly terminated at that level. At about the same region, sea stars of several species are abundant, preying upon the sea urchins and the mussels as well.

Just above low water, the Jonah crab (*Cancer borealis*) abounds. This and the related rock crab (*Cancer irroratus*) are marketed in Boston as "hard-shell crabs" (Plate I).

TIDAL POOLS ARE NEPTUNE'S GARDENS

Here and there, far down the rocks in this intertidal area, are hollows in the ledges, within which water is retained even when the tide has ebbed to its lowest. Elsewhere the creatures of the ocean margin are nicely graded and assorted in orderly frieze-like bands according to the length of time they can endure exposure to the air. But in these tidal pools there is no such selective regimentation, so that the life of all zones is concentrated and intermingled.

Each pool is a veritable sea garden, luxuriant with living things, replete with sea vegetation, and swarming with darting and expanding forms—a riot of rich color.

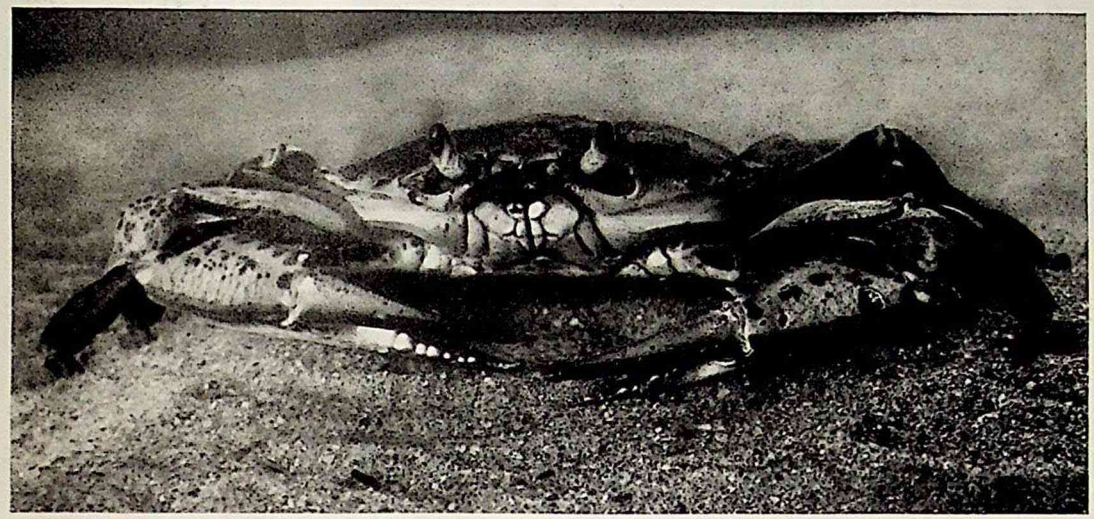
Yet this vital world is plentifully supplied with food and oxygen, for twice a day the life-giving flood of the ocean surges in upon the pool, the turmoil of its white foam dashing over the rocky terraces. Multitudinous planktonic creatures saturate its waters and are eagerly devoured by the sequestered life of the sea garden.

Newly hatched larvae, born in the open sea, either become the prey of the inhabitants or settle down in the crevices to become new members of the colony.

At Nahant, Massachusetts, if we climb down a 60-foot cliff that hems in the shore with its granite ramparts, we suddenly come upon a natural bridge spanning a 20-foot tidal pool, visible only at low water.

The surroundings are wild, almost grotesque. Huge crags of red granite, seamed with white quartz and contrasting dark bands of basalt, stand torn apart from the cliff, as if by some giant hand.

One of these, known locally as Pulpit Rock, tilted toward the sea, towers at a sharp angle just north of the pool. The surf



Photograph by Mary C. Dickerson

A LADY CRAB BURIES "HERSELF" IN THE SAND

When alarmed, it squats down upon the sea floor and works backwards into the sand with paddle-shaped hind legs. Shortly, it is completely concealed, except for protruding eyes and antennae, which, though alert and sensitive, are difficult to detect (page 216).

dashes against its base, which is broadly banded with the conspicuous marking of the nine-foot tidal zone, the white barnacle frieze and festooned rockweed standing out sharply against the colored rock.

If we bend down and peer through the bridge, we may see Pulpit Rock framed in the archway. We stoop nearer to the pool, bracing ourselves against the damp seaweed clothing the sides of the arch. The fronds are dotted with small yellow and brown banded shells of the lesser periwinkle (*Littorina palliata*).

Looking through the transparent water of the pool, shaded from the reflected sunlight by the overhanging rock, we can make out every detail of the basin's bottom, but not an inch of the bare rock is visible.

A ledge to the left gleams with iridescent Irish moss and crimson dulse, relieved by the velvety green of sea lettuce. Rockweed floats about it like soft scalloped draperies, borne upward in the water by multitudinous air floats and adorned with fluffy dark-purple tassels of pompon weed (*Polysiphonia fastigiata*). The overhanging side of the cavern is crowded with black mussels, upon which a bright colony of dog whelks is joyously feasting (Plate II).

ENTER A KNIGHT IN ARMOR

Suddenly the weed at the left is parted and out stalks a large "buckie" (*Buccinum undatum*), or furbelowed whelk, like an armored hero of a play stepping forth from the wings of a theater. In stately fashion it proceeds to the center of the stage. Its head, with tapering tentacles, and the furbelowed border of its undulating foot, patterned conspicuously in black and white, extend from beneath the helmet-shaped shell.

It marches forward and tentatively investigates a clump of horse mussels. These immediately clamp their slightly gaping valves tightly shut to protect the bright orange-colored edge of the soft mantle that just now protruded from their margins. The enemy turns elsewhere.

In a sequestered nook a sea peach (*Cynthia pyriformis*) nestles its smooth, red-cheeked, oval body at the edge of a feathery thicket of purple-pink coralline (*Corallina officinalis*). This creature belongs to the group known as ascidians, or tunicates, of which many species are found along the coast, including the scarlet sea potato. Their rounded oval bodies, often brightly colored, certainly are suggestive of terrestrial fruits and vegetables.

Each ascidian has a pair of projecting siphons, one of which draws the sea water into its body and the other ejects it forcibly after it has been filtered. For this reason they are often known as "sea squirts."

A little farther along in our pool the hard bottom is covered with green encrusting sponges, enameled and overlaid with

patches of magenta lime-secreting algae, and brown, white, and scarlet sea mats, or moss animals, completely concealing what would otherwise be bare rock with a gorgeous irregular mosaic of bright hues.

Over this colorful pavement crawl and sprawl multitudes of sea stars, brittle stars, and sea urchins (Plate III). These echinoderms, or spiny-skinned animals, are abundant in northern seas, and, as we shall see later, have an important effect on the animals of the sea bottom (page 231).

All are characterized by body parts radiating from a common center, on the under side of which is the mouth, also centrally located. Their skins bear multitudes of spines which move upon ball-and-socket joints, and all have "tube feet."

These are small, hollow, cylindrical projections with a pneumatic disk at the end. The creatures move about by stretching out scores of these tube feet, attaching them to the rock, and then pulling the body forward, the spines acting as levers.

In our pool, the conspicuously contrasting and varied color patterns of the sea stars add to the gardenlike beauty of the submarine vista.

Prominent inhabitants of the tide pool are the ubiquitous sea anemones. Their soft, cylindrical bodies may be contracted to velvety mounds, but, if watched, they soon expand to full height, gradually unfolding a fluffy crown of tentacles surrounding a central mouth. These tentacles radiate in all directions like the petals of a flower. One of the most common species is the sea chrysanthemum (*Metridium marginatum*), with which the ledges are crowded close under the water surface (Plate III).

The small white-armed sea anemone (*Sagartia leucolena*) is a slender, translucent species of small size, generally about one-half inch in diameter. It is usually pale blue with delicate whitish arms, and may be seen growing on the rockweed or on shells or stones.

ANIMALS OF THE SAND AND MUD

From Cape Cod southward, the coast of New England is characterized by long stretches of sandy beach where the shore is exposed to the open sea, and, in sheltered places, by mud flats in the bays or in the lagoons behind the outer sand bars.

On the outer face of the bars, where the loose sand is shifted about by the waves and there is no mud mixed with it, shallow-water life is sparse, but, nevertheless, certain animals have become adapted to this strenuous existence.

One of the most interesting is the lady crab (*Ovalipes ocellatus*), a handsome creature with a light-yellow carapace, or shell, covered with purplish rosettelike markings (page 215). The last pair of legs has paddle-shaped terminal joints by means of which the crab is able to swim sidewise through the water with considerable speed. Then, settling down upon the sand, it will suddenly bury itself in it, using its paddles and working itself down backward, until only the stalked eyes are visible above the surface.

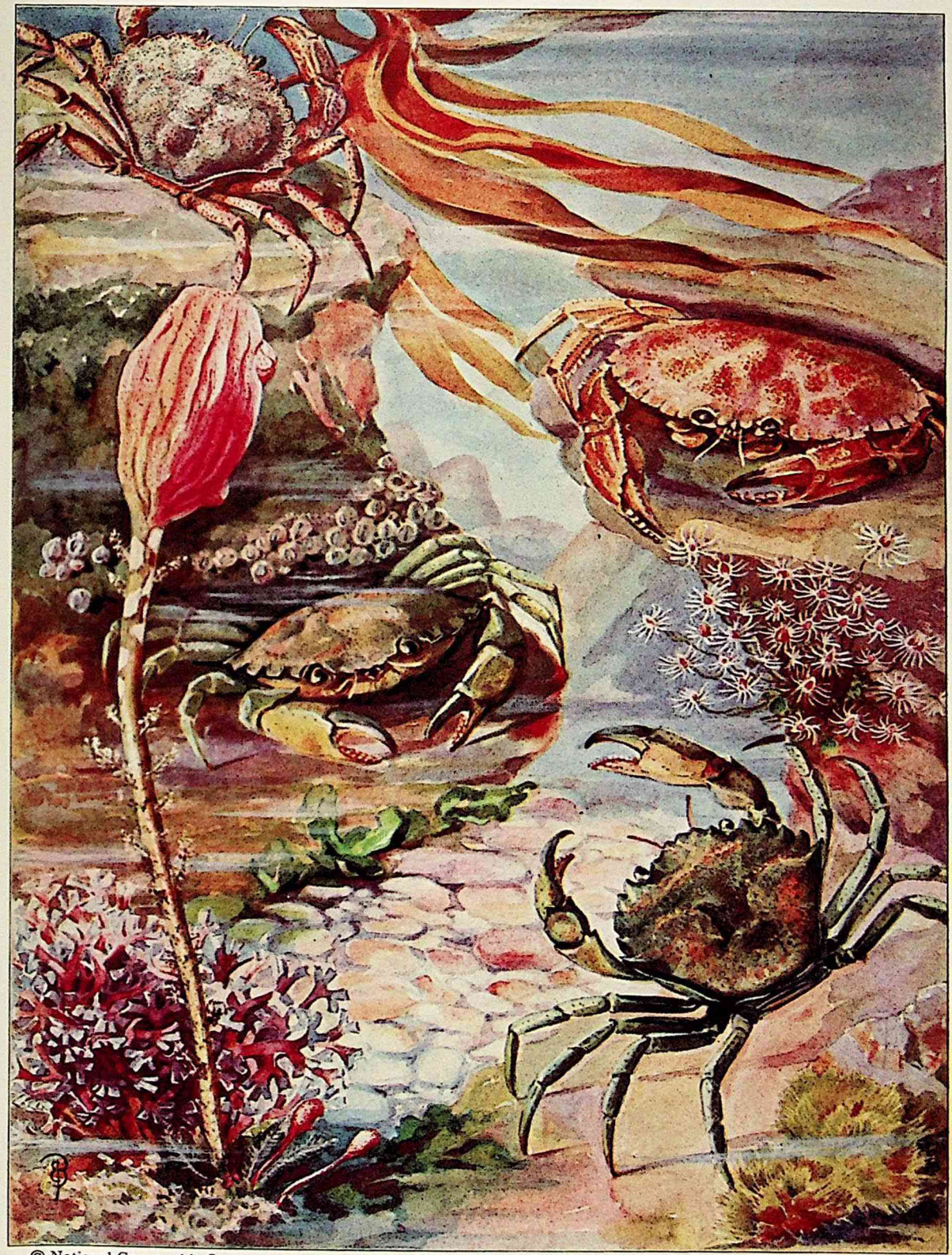
THE ELUSIVE RAZOR-SHELL CLAM

Here, also, the razor-shell clam (*Ensis americanus*), so-called from the long, narrow shells, reminding one of an old-fashioned razor, may be seen lying quietly upon the sea bottom. But if you approach, it suddenly pushes a powerful tapering foot from between the ends of its shell and inserts it into the sea bottom. Immediately the shell pops upright and shoots down into the loose sand until the clam is completely hidden. When alarmed, it will dig down faster than it can be pursued with a shovel.

The sand-collar snail (*Lunatia heros*) is one of its chief enemies. This is a mollusk with a rounded shell, about as big as one's fist, sometimes known as the "moon shell." When the creature is alarmed, an enormous body is packed away in this small space, but, if left alone, it will gradually push its immense foot out, fore and aft, and crawl rapidly over the sand, stalking its prey. As it moves, it pushes forward a huge apronlike fold of its foot, above which waves a pair of tapering tentacles having eye spots (page 226).

The egg case of this species is a long, curving, ribbonlike structure of gelatinous substance, which is pushed out from beneath one edge of the apron to form a collar or capelike band, beneath which thousands of transparent beadlike eggs adhere like a mosaic lining. This is shed and left behind on the sea bottom. Often it is cast up on the beach, the sand clinging to its sticky surface. When dry, it is extremely fragile, and, if picked up, crumbles in the fingers.

At the edge of the surf on outlying sandy beaches, especially when the tide is



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CRABS, SCAVENGERS OF THE SEA, ABOUND IN CRACKS AND POOLS

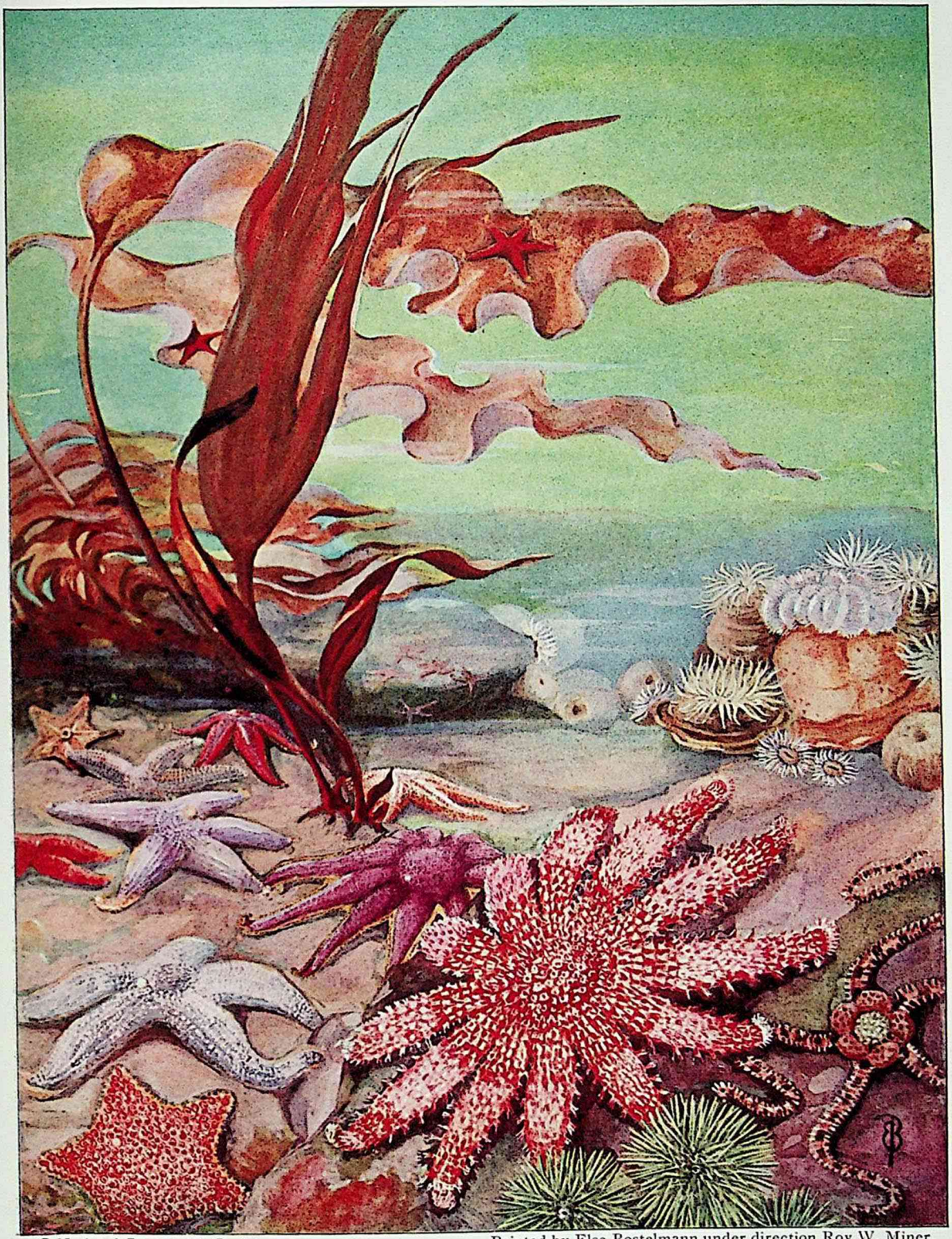
Engaged in a sparring match are GREEN CRABS (foreground) on the rocky coast of Maine. Unlike the ROCK CRAB (upper left), and the JONAH, crouching in a crevice at the right, the green variety is not edible. These two are the "hard-shells" of Boston and Newport markets. Young of the tall SEA POTATO, or "sea squirt" (left), swim about when first hatched like tadpoles. Below is a clump of IRISH MOSS, from which a table jelly is made. Pink-hearted HYDROIDS cluster in the right center.



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MYRIAD SEA PLANTS AND ANIMALS LIVE IN THIS POOL LEFT BY THE RECEDING TIDE

Under a ledge scores of DOG WHELKS feed on BLACK MUSSELS. From the former is produced a purple dye, once used by Indians; egg cases appear at the top. White shells of ROCK BARNACLES grow between and upon the mussels. A flat, oval LIMPET adheres to the ledge (upper right), while to the masses of ROCKWEED below MOSS ANIMALS cling. The fronds also are adorned with branching HYDROIDS and daisylike SEA ANEMONES. Climbing up the KNOTTED ROCKWEED (left) is a LESSER PERIWINKLE and above it is fluffy POMPON WEED. From behind comes a "buckie," or FURBELOWED WHELK, searching for HORSE MUSSELS beneath feathery PINK CORALLINE. The urn-shaped body is a SEA PEACH.

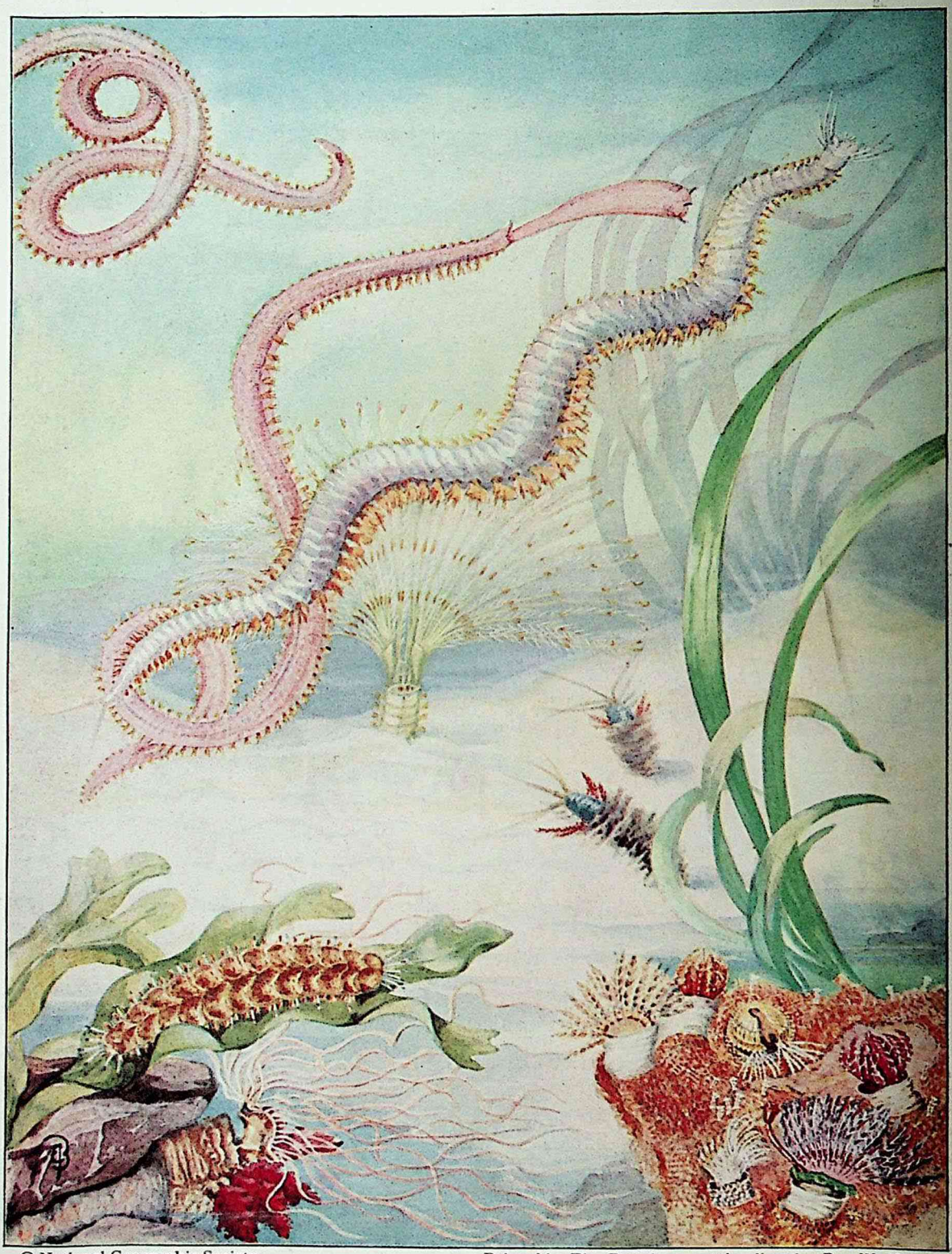


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SEA STARS, LIKE SKY STARS, VARY IN SIZE AND BRILLIANCY IN THE GULF OF MAINE

Most conspicuous is the red and white SUNBURST STAR with arms "radiating." Beyond it is a common SUN STAR with 10 arms. The red PHRYGIAN SEA STAR (lower left) has short, stumpy arms. This and the brown CRISP SEA STAR (left center) are usually found in water of 10 fathoms or more. Most abundant are the COMMON STARFISH and FORBES'S SEA STAR, several of which, varying in color, sprawl to the left. On kelp fronds waving above crawl two small RED STARS. SEA CHRYSANTHEMUMS display petal-like tentacles on the mound (right). Just below are two WHITE-ARMED ANEMONES. Slender arms squirming, a BRITTLE STAR (lower right) crawls to shelter. GREEN SEA URCHINS in the foreground.



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SWIMMERS AND BURROWERS LIVE IN SANDY MUD FLATS SOUTH OF CAPE COD

Two pink BEAKTHROWERS, disturbed by a fat, bluish CLAMWORM, dart spiral fashion to safety. One sticks out its club-shaped "tongue" at the intruder. Behind them a FAN WORM suddenly spreads its delicate plumes like a peacock's tail. Peering from chimneys, RED-PLUMED WORMS (center) with lancelike feelers resemble medieval knights. A brown SCALE WORM crawls over rockweed fronds. Just beneath is an ORNATE WORM. Gay-hued SEA WORMS on a pebble in front of the eel grass are magnified in the opposite plate.



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UNDER A MAGNIFYING GLASS, A SEA WORM METROPOLIS RISES ON A TINY PEBBLE

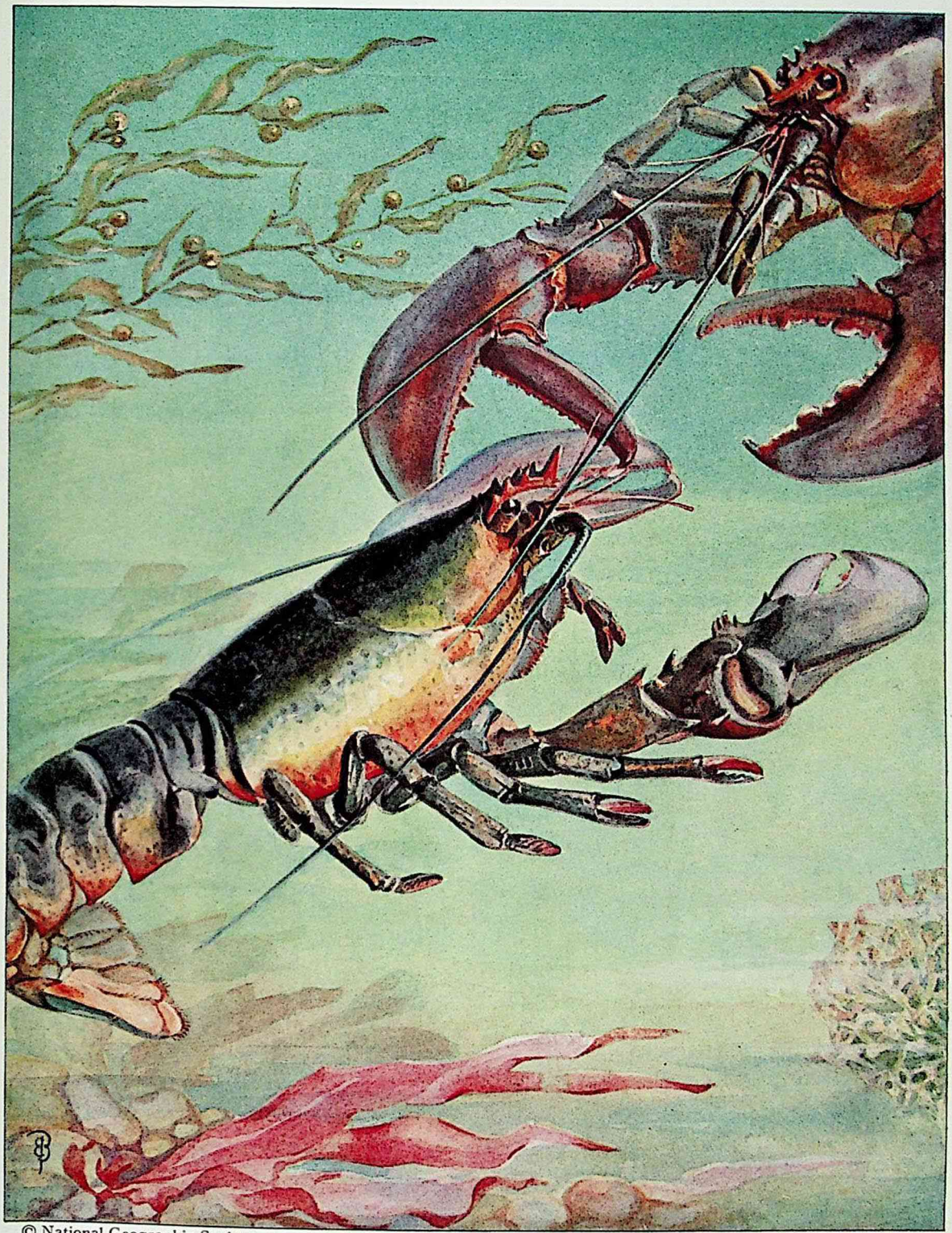
Petal-like breathing organs give the SEA DIANTHUS (foreground) the appearance of a spreading flower head. Each plume has tiny eyes so sensitive to light that, when a shadow passes, the "flower" pops into the tube. Crowned with golden "piano keys," SAND BUILDERS (upper and lower left) carefully wall themselves in with sand grains. Grayish tentacles protruding like "whiskers" are covered with a sticky substance that catches bits of food. Shells of thousands of BRYOZOA, or MOSS ANIMALS, and HYDROIDS blanket the background. SWALLOW-TAIL PROTOZOA extend Y-shaped lappets (lower right).



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PUT ON A HELMET, GO DOWN AND MARVEL AT THE LIFE ON AN OLD WHARF PILE!

These colorful creatures pump in water, from which they extract food. Yellow SEA GRAPES (top) are related to the backboned animals. A colony of SNOWY TUNICATES is the white patch below, and the rosy mounds (right) are SEA PORK. Near the bottom are large yellow, transparent SEA VASES with long, extended siphons. To seaweed cling green SEA BEADS. Left, working downward, are clusters of HORSE MUSSELS, pink-hearted HYDROIDS, REDBEARD SPONGES, and the SEA DIANTHUS worm (Plate V). In contrast to these stationary creatures are shown SEA ANEMONES, that move slowly, a purple SEA STAR, which crawls, a JELLYFISH, which drifts aimlessly, and the SQUID and CUNNER, which dart swiftly.



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LIKE KNIGHTS OF OLD, LOBSTERS, HEAVILY ARMORED, LOVE A FIGHT

The AMERICAN LOBSTER ranges from Nova Scotia to Long Island. Usually one claw is heavier than the other and equipped with knobs for crushing (upper right). The cutting claw has a sharper edge with small teeth. Eyes are mounted on stalks and may be turned in any direction. The first two of its four pairs of walking legs bear small pincers. Underneath the body, forward, are the gills, and, farther back, the tiny, oarlike swimmerets. Most powerful organ is its jointed tail, which, when bent suddenly forward, shoots the lobster backward. When a female carries eggs on her swimmerets, she is "in berry" and illegal for capture. Slender feelers give lobsters a keen sense of smell.



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Painted by Else Bostelmann under direction Roy W. Miner

TROPICAL SPONGES OF BATHROOM USE HAVE RELATIVES IN NORTHERN WATERS

But they have no commercial value. Through pores water is sucked in and food filtered out. Waste water is then ejected through a chimneylike opening, the osculum. Most sponges are made up of many individuals welded together. Common in New England tidal pools is the CRUMB-OF-BREAD SPONGE (upper background). Near it is a pink EYED FINGER SPONGE. Waving weirdly below is a pale DEAD-MAN'S-FINGERS SPONGE. Brilliant REDBEARDS frequent the shallows, and yellow SULPHURS (left) cling to stones. Tube-shaped sponges grow on dead mussels (foreground).

coming in, one may often see hundreds of little oval shrimplike creatures, the mole shrimps, or "sand bugs" (*Hippa talpoida*). These peculiar little animals burrow in the loose sand, but are often washed out by the incoming tides, whereupon they immediately dig in again. Sometimes, after heavy storms, they will be found in windrows at the edge of the surf. They have yellowish shells tinged with purple (p. 214).

In the more sheltered bays and harbors in southern New England, the bottoms consist of sand mixed with mud in various proportions. The mud not only gives a more solid bottom to the mixture, but, being derived from silt washed from the land, contains much decaying food material.

In such localities, therefore, a prolific animal and plant population may be supported. Here we find a remarkable concentration of life, not only upon its surface, but also burrowing within the sea bottom itself.

Marine worms are particularly abundant, both in actual numbers and in variety of species. Every square foot of soil is filled with them, as anyone can see by digging with a shovel near the low-tide mark, both above and below the water level.

MARINE WORMS ARE SEA JEWELS

The marine worms include some of the most beautiful and interesting of all sea creatures; so much so that Linnaeus and his successors drew upon Greek mythology for their scientific names, calling them after goddesses and nymphs. Such names as Aphrodite, Clymene, Amphitrite, and Lycidice, were used for their genera, while their specific names are reminiscent of flowers, brilliant colors, and grotesque ornaments (Plate IV).

The clamworm (*Nereis virens*) digs through the sea bottom in search of soft-bodied creatures which it may tear to pieces with its sharp, pincerlike jaws. Ordinarily these are located in its throat, lying within a sac. When in use, this sac is turned inside out, being thrust out and inflated to form a proboscis with the biting jaws at the end.

At times the worm glides out into the open water, swimming with rapid undulations, the waves of which pass quickly from head to tail. The long, tapering body is clad in a many-jointed armor, gleaming with rainbow colors, and is aided in its progress by myriads of oarlike, paired appendages of bright-orange hue, glistening with golden bristles, which sweep the water on both sides in ordered succession.

What appears at first sight to be chance accumulations of shell fragments and bits of dead seaweed resolves itself into tiny chimneys extending from the sandy mud. As we watch, a cluster of tapering, lancelike tentacles is thrust from the opening and spread out symmetrically, followed by a head and shoulders clad in steely-blue plate mail and adorned with waving blood-red plumes. This is the plumed worm (*Diopatra cupraea*).

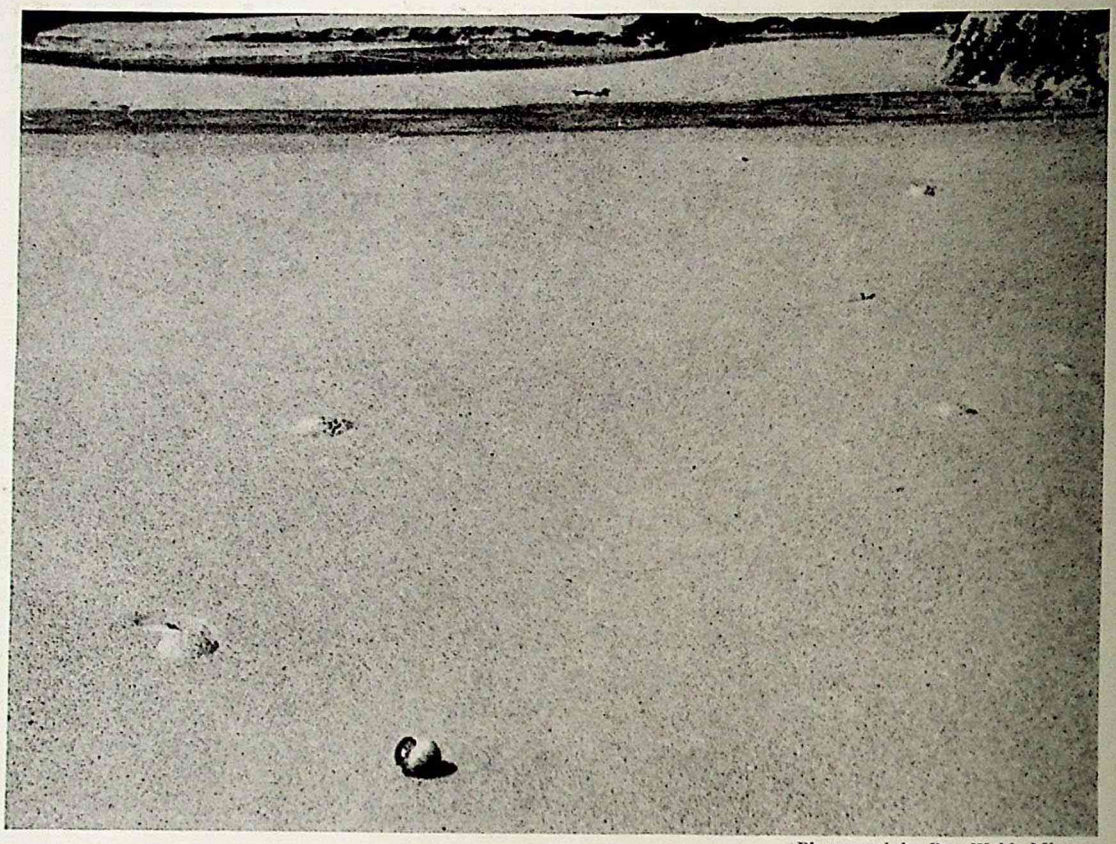
Near by, a cluster of rockweed floats out from the edge of a bowlder half buried in the sand. One of its olive-brown fronds seems to come to life. On closer inspection we find that this is an illusion, for a curious little creature about an inch in length is crawling along the seaweed. Its mottled body blends with the color of the *Fucus* so closely that it is betrayed only by its motion. Its back is covered with a double series of delicately wrought, overlapping scales, while small bunches of golden bristles extend from the sides. This is the scale worm (*Polynoë squamata*).

Beneath the edge of the overhanging rock a wonderful sight now bursts into view. From the mouth of a little mud-colored, leathery tube, two or three delicate, threadlike filaments feel their way out into the water in speculative fashion. Soon others pour out by the score, extending in all directions, undulating in sinuous curves.

Just as we are wondering if the tube is entirely filled with these living threads, they are seen to be merely the fringe of a flesh-colored funnel, the expanding edge of which follows them out of the tube.

Now a rosy-purple, shield-shaped structure erects itself in the midst of the filaments, reminding one of a flower petal. This is followed by three pairs of treelike scarlet plumes, their complex spiral stems surrounded by tufts of branchlets which extend and contract, pulsating rhythmically. A segmented body begins to disclose itself, and we recognize one of the most gorgeous of sea creatures, the ornate worm *Amphitrite ornata*.

A little to the right, at the edge of a tuft of eel grass, a miniature ledge projects from the sand of the sea bottom. Its top is almost completely concealed by an irregular mass of coiled, limy tubes, each with a round opening not more than an



Photograph by Roy Waldo Miner

LIKE A LONE DESERT TRAVELER SEEMS THIS SAND-COLLAR SNAIL ON A BEACH

About the size of a man's fist, the rounded shell contains an enormous body. It feeds upon other mollusks, especially quahogs, the shells of which it pierces with neat holes about a quarter of an inch in diameter (page 216). Its burrows appear behind the snail.

eighth of an inch in diameter (Color Plates IV and V).

These tubes in turn are blanketed with a reddish-brown crust, engraved with fine markings like the engine turnings of a gold watch case. The ends of the limy tubes protrude through this in all directions.

Suddenly, as we watch, a beautiful little flowerlike head emerges from a tube opening and unfolds a circlet of delicate, fern-shaped plumes. Brilliantly banded with purple, brown, and white, these expand on all sides.

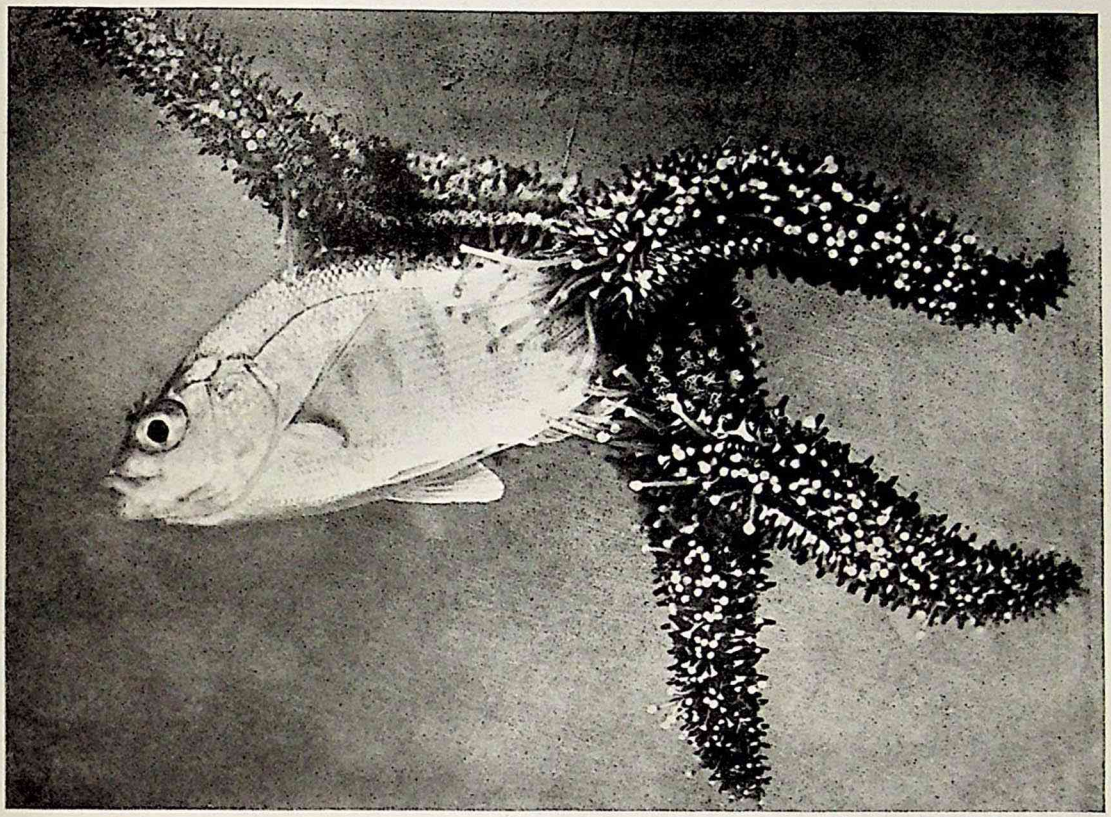
Heads now appear from tube after tube, until the whole surface of the ledge blossoms with animal flowers in every shade of gorgeous color. Some are bright yellow. Others are blue-gray, banded with pink. Still others are patriotically adorned with red, white, and blue stripes.

As the "petals" become fully extended, we see that they are arranged in two fan-like halves. On closer inspection, we perceive a smooth, flexible rod extending from the edge at the end of one row of the plume-like organs. At its free end, it bears a lily-shaped structure with radiating spine tips.

Accidentally, we pass a hand between the ledge and the light, thus casting a shadow over the pulsating garden. Within the twinkling of an eye, every circlet closes and pops back into its tube, the lilylike organ being pulled in last. As it reaches the circular doorway, this structure opens like an umbrella, effectively closing the tube. It functions as a cover.

These colorful animal flowers are really sea worms, the sea dianthus (*Hydroides dianthus*). It is obvious that their fragile beauty is far removed from the unesthetic ugliness of their relative, the earthworm.

But we have not fully appreciated the possibilities of our rock fragment. Let us carefully remove it, encrustations and all, from its submarine bed and submerge it in a dish of sea water. The whole specimen is



Photograph by H. S. Jennings

WOE BETIDE THIS "POOR FISH," CAUGHT IN THE MAW OF A SEA STAR

Struggle though the butterfish may, it cannot dislodge the hundreds of tiny feet equipped with suckers. The starfish will gradually digest its living meal, tail first. Butterfishes sometimes hide beneath jellyfish "umbrellas" to escape their enemies (page 228).

no larger than the palm of our hand. Now place it under a low-power microscope in a good light (Plate V).

A SEA WORM COMMUNITY MAGNIFIED

Let it remain undisturbed for a while, and soon the entire colony of *Hydroides* expands. The plumelike breathing organs, for such is their function, are more clearly seen and their subdivisions show delicate color patterns not before visible.

One of their most interesting features is now prominently displayed. A series of little gleaming lenses forms a row along the main stem of each plume. These are actually eyes which focus the rays of light upon a pigmented surface. Thus we have the secret of their sudden withdrawal when a shadow passes over them.

Let us now look at the reddish-brown crust covering the worm tubes. To our amazement it has become a veritable city of living creatures! The minute markings, when magnified, are resolved into thousands of recumbent vases, set close together, each with a tiny circular opening near one end, equipped with a trapdoor.

As we watch, the trapdoors here and there pop open. Out slip little cylindrical bundles which open up as lily-shaped circlets of transparent golden tentacles surrounding a central mouth. The delicate creature to which they belong lies within the urnlike home, attached to it by a pair of minute muscles. When it is disturbed, these contract, and the animal pops back into its shell.

There are many different species of such little animal communities, growing in matlike encrustations over stones, seaweeds, and dead shells. When fully expanded, they have a fluffy appearance like fine moss, and are therefore known as moss animals, or sea mats, or, scientifically, the Bryozoa. The particular species in our miniature community is the unicorn bryozoan (*Schizoporella unicornis*), so-called from a single minute spine in front of the shell opening.

We must not leave our Lilliputian city on the rock without meeting that redoubtable mason, the sand-building worm (*Sabellaria vulgaris*), which builds a tube of carefully selected sand grains to dwell in (Plate V).

This strange animal is equipped with bunches of gray, hairlike tentacles with which it explores its neighborhood for food particles. These adhere to the tentacles and are transferred to a remarkable series of shining golden plates set close together on either side in two semicircular rows. They move successively like piano keys and manipulate the food material into the mouth cavity in front, where it is sorted by a sensitive conical appendage, or "tongue," the acceptable particles being swallowed and the rest rejected.

ANIMALS OF THE WHARF PILES

Now we leave the sandy flats and, skirting the coast, find our progress interrupted by an old abandoned wharf with rotting piles and sagging timbers.

We borrow a rowboat and scull out along the side of the ancient structure until we come to a gap where a pile is missing. Carefully we push our boat in under the wharf, and, placing a waterglass in position over the gunwale, look down through it along the side of one of the piles (Plate VI).

Below the surface, a marvelous sight bursts upon the view. The whole pile is a gorgeous sea garden, completely covered with gayly colored and luxuriant growths as far down as our vision can penetrate through the dusk of the green sea water.

Huge masses of sea grapes (*Molgula manhattensis*) float in heavy clusters just below the surface. These are ascidians of rounded form, about the size of a hothouse grape, yellow in color, and each one equipped with a pair of protruding siphons.

Below them, sea anemones, brown, white, pink, and yellow, expand their fringed disks among colonies of dead barnacle shells overgrown by a green encrusting sponge. Clusters of horse mussels (*Modiola modiola*), coated with red moss animals, peep out above the fluffy growths of fairy-like, pink-hearted hydroids (*Tubularia crocea*).

Patches of the snowy tunicate (*Leptoclinum albidum*) show conspicuously white among its brightly colored associates. Rounded domes of the pink sea pork (*Amarouocium pellucidum*) cluster thickly in magnificent rosy luxuriance. Sea stars (*Asterias vulgaris*) creep slowly over their neighbors in search of luscious mussels.

Pale-yellow sea vases (*Ciona intestinalis*) show their highly colored orange and scarlet internal structure through their translucent walls, and even our old friends, the sea dianthus (*Hydroides dianthus*), are not missing, for large areas of the wharf pile are blossoming with their multicolored gill circlets.

All these creatures anchor themselves where the tidal currents rhythmically bring a wealth of microscopic animals and plants. All are equipped with internal contrivances to filter out this flood of nutritive material.

In contrast to this stationary habit, other organisms, belonging to the same range of animal subkingdoms, float or swim through the neighboring water. The red-rayed jellyfish (*Dactylometra quinquecirrha*) glides gracefully by, aimlessly contracting and expanding its umbrella disk as it drifts with the currents. Its sting cells give it the power to kill for food many small invertebrates and even young fishes of moderate size.

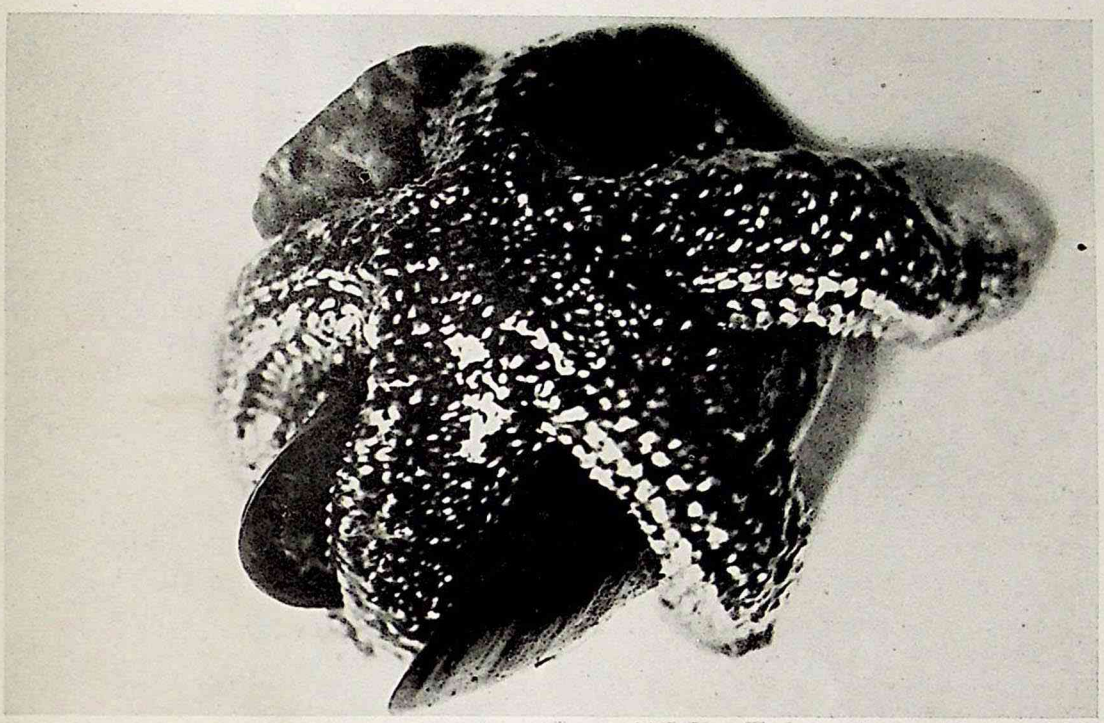
Larger fishes usually keep away, for it can sting their mouths painfully. Yet, strange to relate, half-grown butterfishes (*Poronotus triacanthus*) will take refuge beneath its umbrella and even nibble at its ruffled tentacles and steal copepods and other small food animals from the corners of its mouth.

The butterfishes are protected from their larger enemies and usually are unharmed by the jellyfish, probably because of the thick coating of slippery mucus which covers them and gives them their common name. Now and then, however, a butterfish will fall prey to its protector, but without affecting the persistence of the rest in remaining associated with it.

A squid (*Loligo pealii*) darts past, easily avoiding the sting cells of the jellyfish, for, if taken unawares, it is likely to wind up in the maw of that gracefully casual swimmer.

CREATURES OF THE BAY BOTTOM

Now let us, figuratively, don diving helmets and explore the bottom of the bay. Here huge granite bowlders are imbedded in the sandy mud. Yonder an outcropping ledge, overgrown with seaweed, looms toward the surface with, perhaps, a remnant of a wreck lodged upon its summit.



Photograph by I. A. Field

A STARFISH DEVOURS A MUSSEL BY INSERTING ITS STOMACH WITHIN THE VICTIM'S SHELL

Creeping upon a clump of mussels, the sea star spreads its arms over a tightly closed bivalve. These tentacles, each equipped with hundreds of suckers, pull steadily in opposite directions, gradually opening it. When the victim gapes to aerate its gills, the starfish literally turns its stomach inside out and pushes it in between the shells. Juices pour out, and the mussel is digested within its own home! Starfish destroy countless oysters in a similar way (page 231).

At intervals the weird shapes of king crabs (*Limulus polyphemus*) may be seen investigating the siphons of clams which protrude from the bay bottom, but what immediately draws our attention is the grotesque forms that are industriously at work furrowing up the sandy sea floor with their huge claws and devouring the clams as they are unearthed. We have chanced to peer into a community of lobsters (Plate VII).

These are among the most remarkable of all the sea animals of the present day. Though they are familiar enough in the markets, it is very likely that one acquainted only with their lumbering awkwardness out of water would be greatly surprised at the ease with which they move about on the sea bottom.

HOW A LOBSTER STALKS A CRAB

Some of the lobsters are crouching in their dens under the rocks, where they seem to stand sentinel as if guarding their homes against marauders.

An unwary lady crab works its way out of its burrow in the sand a short distance away. The lobster is all alert and immediately begins to stalk it, moving forward literally on tiptoe, just touching the sea floor with the ends of its walking legs.

Now it stops, poised, with the swimmerets under its tail beating in unison like banked oars. As the crab emerges further, their speed increases.

Too late the crab becomes aware of its enemy and leaps sidewise up into the water, waving its paddle-equipped hind legs frantically back and forth over its carapace.

The swimmerets of the lobster now beat the water at full speed. It darts upward and pounces upon its unhappy victim.

Grasping it and crushing it with its powerful claws, the lobster sinks down to the sea floor, and, pulling the fragile shell of the crab apart, feeds it into the "gastric mill" of its complex mouth.

Just as the meal is about to be finished, another huge lobster near by scents the re-



Photograph by Roy Waldo Miner

SUCH A "TANGLE" DRAGGED ACROSS OYSTER BEDS CAPTURES RAVAGING SEA STARS

Chains with bunches of cotton waste tied to the links are lowered to the oyster beds and dragged back and forth. In this way, at a single haul, hundreds of the invaders are entangled by their rough spines and brought to the surface. When used regularly, the apparatus makes noticeable inroads upon the starfish which at times do much damage to oyster beds (opposite page).

past and dives for his neighbor. The latter, alarmed, puts into action the most effective means of locomotion that he possesses: namely, the powerful tail. This fan-shaped organ is swept vigorously beneath his body, shooting him backward into his den with tremendous speed. Now he crouches at bay, but after a brief sparring match (Plate VII), the assailant withdraws, and retires to his own cavern situated a few feet away in the midst of a luxuriant growth of sponges.

Lobsters have strong proprietary instincts and will defend a chosen location against all comers. But they are also aggressive, often struggling to oust each other from their holdings.

SPONGES OF NORTHERN WATERS

Though none of the sponges of our northern seas is of commercial value, they are very diversified and occur abundantly everywhere, not only attached to ledges on the bay bottoms, but among the submerged rocks and bowlders right up to the water's edge and in the rock pools (Color Plate VIII).

The sulphur sponge (*Cliona sulphurea*) is a bright-yellow species that grows attached to stones, and is of frequent occurrence on dead shells, the limy substance of which it softens and absorbs. Hence it is also known as the "boring sponge."

One may often pick up on the beach dead whelk shells completely permeated with a network of fine canals made by the absorbing fibers of this sponge. Its surface is quite characteristic, being covered with small warts, or papillae.

The crumb-of-bread sponge (*Halichondria panicea*) grows commonly in tide pools and rocky crevices below the water line. It forms encrustations which often

rise as closely crowded conical chimneys, or long cylindrical tubes, where the growth is on a vertical or overhanging rock.

Its color shades from a soft gray-green to yellowish, and the chimneys are lined with bright orange. It is frequently associated with the eyed finger sponge (*Chalina oculata*), a lovely rosy-pink species growing in clusters of flat fingers conspicuously spotted with oval or circular openings, the oscula, scattered over its surface at intervals.

The dead-man's-fingers sponge (*Chalina arbuscula*) is a treelike growth about twelve to eighteen inches in height, light gray or yellowish white in color, made up of long, slender, tapering branches that wave to and fro with the currents. Fancied resemblance to pale spectral hands has given them their gruesome name. The branches are very soft and delicate.

Among the most interesting animal communities of the northern shallow waters are those centering around the oyster and mussel beds. The importance of the common oyster in our markets has made the investigation of the best conditions for growing it, as well as the study of its enemies, of great concern to fisheries experts.

THE OYSTER'S DEADLY ENEMIES

The most destructive of the enemies are the common sea stars belonging to the two species, *Asterias vulgaris* and *forbesi*.

Oysters grow on sandy mud flats on a "clutch" formed by the dead shells of other generations of oysters, or on a rocky or shelly bottom. Slightly opening their shells, they allow a current of water to be passed over the gills to filter out their microscopic food, which consists mostly of diatoms.

Sea stars often invade these beds in great numbers, and, at their approach, the oysters close their shells tightly. The raiders, undismayed, proceed to mount their victims, and, bracing the tips of their arms on surrounding material, take a firm hold on the two shells of the oyster with their countless tube feet and pull steadily in opposite directions (page 229).

Soon the single powerful muscle of the oyster, which keeps the shell closed, begins to weary and yields to the pull.

Then a strange thing happens. The sea star turns its sac-shaped stomach inside out through its mouth, inserts it between the shells of the oyster, pours out digestive fluids, and digests the oyster in its own shell!

The inverted stomach then absorbs the fluid products of digestion through its stomach walls; the sea star withdraws that organ, and, leaving the shells of its victim completely cleaned out, proceeds systematically to the next.

An army of sea stars thus can commit great ravages in a short time.

The oyster drill (*Urosalpinx cinerea*), another important enemy, infests the beds in great numbers. It is a little sea snail with a wavy, spired shell, which bores neat pinholes through the oystershell and sucks out the soft parts. The next time you pick up a dead oystershell from the beach, look and see if it is not perforated by many of these holes.

RELENTLESS STRUGGLE FOR SURVIVAL

The most dramatic phase of the struggle for existence is the slow, relentless, soulless battle that takes place through overcrowding. This is especially well exemplified in the vast mussel beds exposed at low tide on many southern New England sand and mud flats.

At Menemsha Bight on Martha's Vineyard, millions of these black edible mussels (*Mytilus edulis*), literally covering acres, are visible in crowded array. Examining those near by, one may see that the best situated individuals are growing over and crowding down those that chance to be less advantageously placed, until the unlucky ones can no longer open their shells and are smothered. Young individuals, in turn, settle down on the shells of their parents and submerge them completely.

The rapid growth of a mussel colony also causes its margins to overspread and contest the territory of other creatures.

At Cold Spring Harbor, Long Island, an oyster bed was growing in shallow water and was uncovered at low tide. Near by there was a vigorous colony of mussels. Soon this species, being of more rapid growth than the oysters, invaded the latter and completely exterminated them.

But swift justice overtook the conquerors. A colony of rock barnacles (*Balanus balanoides*) occupied a neighboring bowlder-strewn point, and, struggling with the problem of overpopulation, like certain nations of mankind, gradually spread onto the mussel bed and soon completely smothered it!

WHERE BIRDS AND LITTLE ANIMALS FIND HAVEN

By Agnes Akin Atkinson

With Illustrations from Photographs by Spencer R. Atkinson

FROM the most distant places, even from India and Australia, come many visitors to Eaton Canyon Bird and Game Sanctuary to see the birds and little animals which live safeguarded in this refuge near Pasadena, California.

The creatures here first became widely known through an article, "Befriending Nature's Children," which I wrote for the National Geographic Magazine of February, 1932. I described the success which Dr. Atkinson and I had had in winning the confidence of our little wild neighbors and in photographing them.

Now the arroyo is a 200-acre haven where all things wild—trees, flowers, and even rocks—are preserved in their natural state.

The city of Pasadena, petitioned by schools, service clubs, and civic organizations whose interest had been aroused by the article for The Geographic, established this retreat, modeled after State and national parks; and one must hope that many such municipal parks may be created throughout the country, safety zones where the small wild life will learn that it can find care and protection.

MOUNT WILSON TOWERS NEAR BY

The arroyo lies on the floor of Eaton Canyon at the foot of Mount Wilson. Wide and beautiful, it is filled with sycamores, live oaks, greasewood, sage, broom, mountain-holly, and other varieties of native growth. Along the bottom is a dry stream bed over which in our brief rainy season an abundance of water tumbles down from the narrow mountain gorge far above. This arroyo, or canyon, with its widely spreading oaks, brings seclusion and solitude close to civilization.

Soon after our first Geographic article appeared, strangers from New York, Canada, Australia, India, and elsewhere, wishing to become friends of our woodland family, began to arrive at our home on the edge of the arroyo. Letters from all parts of the United States and from many foreign countries filled our mail box.

More than four years have gone by since we first described our hobby, but letters continue to arrive. People still come to our living room and watch with us these animals that have grown so accustomed to us that they no longer object to the lights burning inside the house. We darken the living room now only so that we can see better what is going on outside.

VARIED QUESTIONS ARE ASKED

Strangers ask at our front door if this is the place where wild animals come to dine, if the canyon below us is where the nature park was built. One man inquired whether down in the arroyo we had any lions and bears!

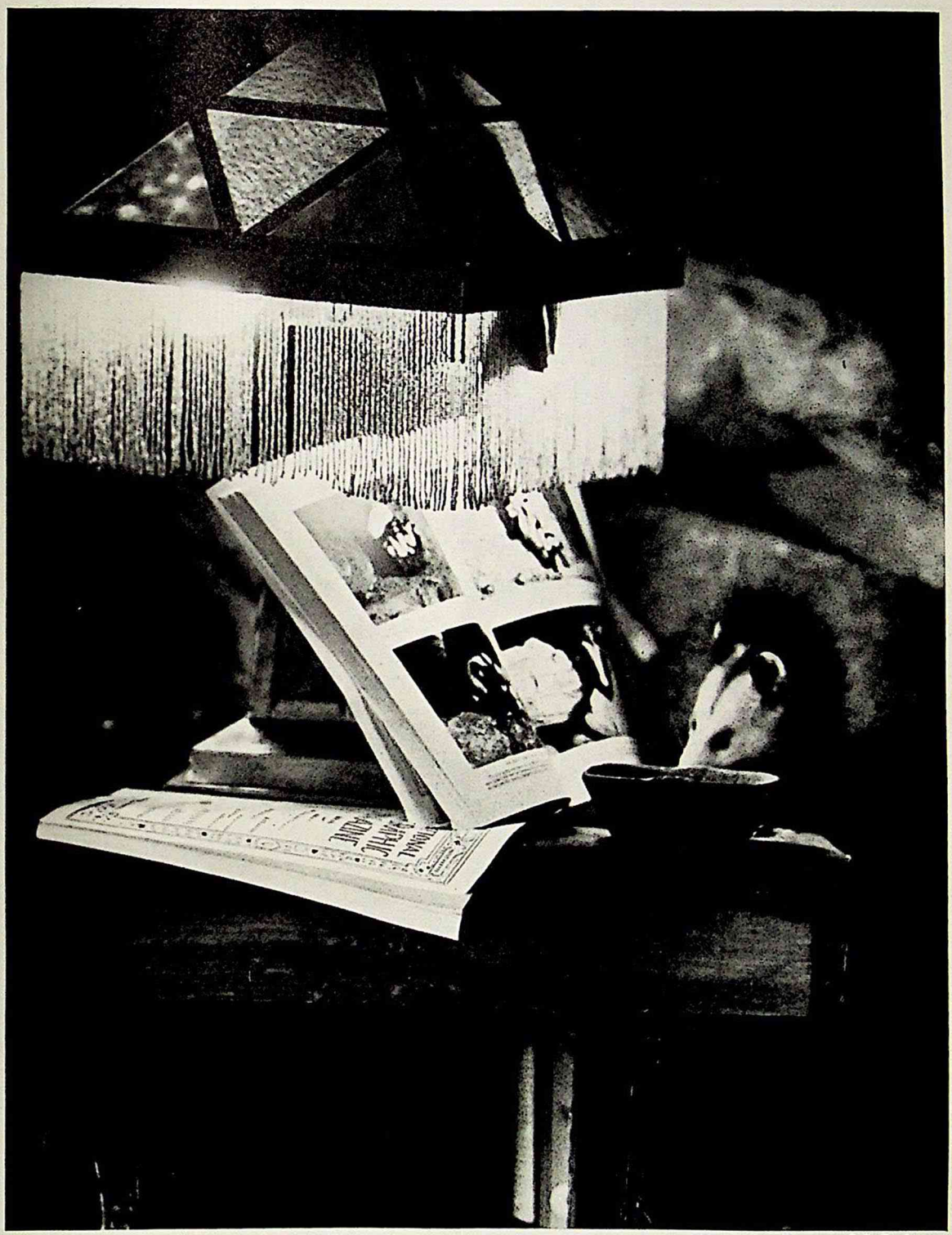
From my study, overlooking this peaceful spot, I can catch glimpses of trails which wind in and out around the rocks and the oaks. An attractive rock bridge spans a small, narrow canyon that joins the arroyo on the east side. Graceful rock steps lead a short distance up the mountain side to a secluded grove of live oaks. Not far away I sometimes see wild deer stop their grazing and look cautiously toward anyone who trespasses on their favorite stamping ground.

From the scenic Foothill Boulevard which adjoins the canyon's edge a few hundred feet beyond our home, a wide, easy trail has been made down into the arroyo. Near the foot of this trail an observatory house—not astronomical, as is the famous observatory above it on the top of Mount Wilson—has been constructed of rocks gathered from the arroyo.

ZOO REVERSED: HUMANS INSIDE, ANIMALS OUT

In one side of this house, facing Mount Wilson, are three large plate-glass windows, through which visitors behold the small wild animals as they come at night to get food which a caretaker places outside on a large flat rock (page 238).

During the day, through these windows one may observe the many varieties of birds which come from all parts of the



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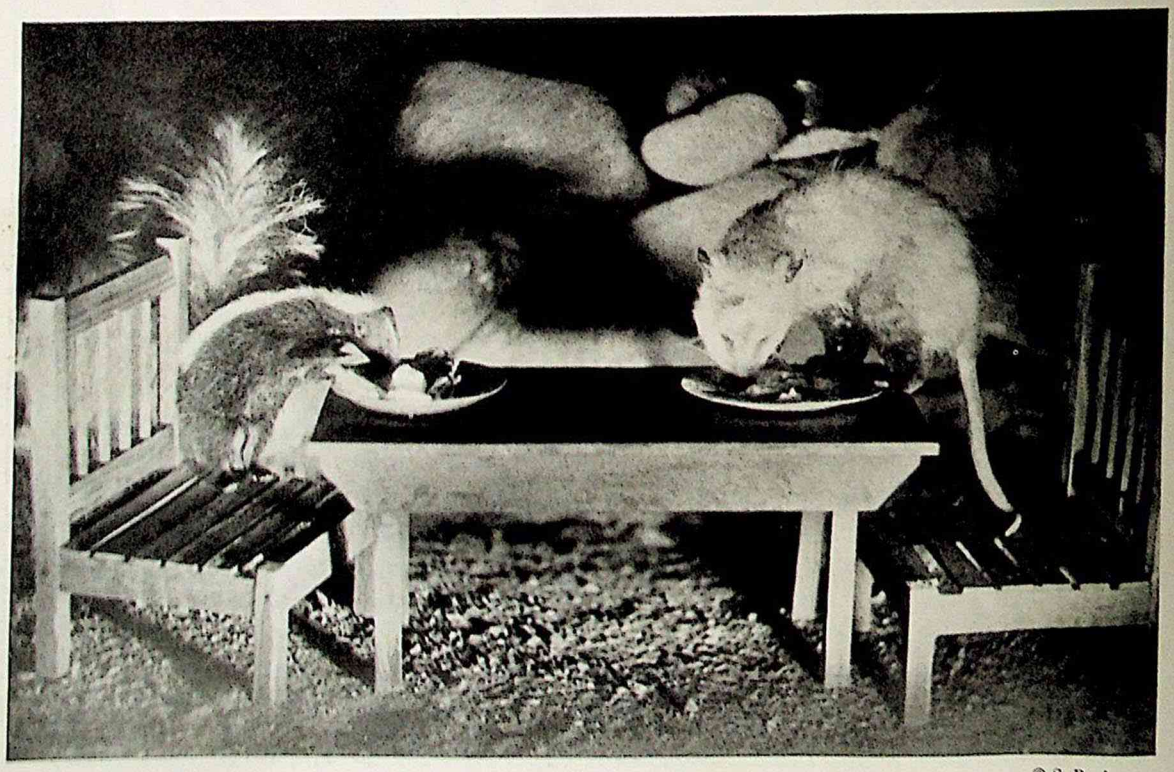
BABY OPOSSUM NIBBLES BACON WHILE SITTING FOR A PORTRAIT

This supper guest pays scant attention to pictures of skunks in a copy of the February, 1932, issue of the NATIONAL GEOGRAPHIC MAGAZINE. Before Eaton Canyon Bird and Game Sanctuary was established by the city of Pasadena, California, trappers were active with their steel devices. A mother fox came to the author's animal dining table with two feet cut off; a ring-tailed cat appeared with a lost leg; and several possums had broken and missing feet. Dr. Atkinson took photographs of these injured animals and showed them on the screen to schools and service clubs, thus aiding in the establishment of the municipal park. City officials of Pasadena met one evening in the living room of the Atkinson home and watched the little animals as they came out of the night into the light to feed (p. 238). Later they made the area a sanctuary.



FEAR HALTS A YOUNG RING-TAILED CAT BOUND FOR A BANANA BAIT

A skunk, whose back and tail show in the picture, may or may not be friendly! The cat's family recently moved from the Atkinsons' garage to more comfortable quarters in the house attic.



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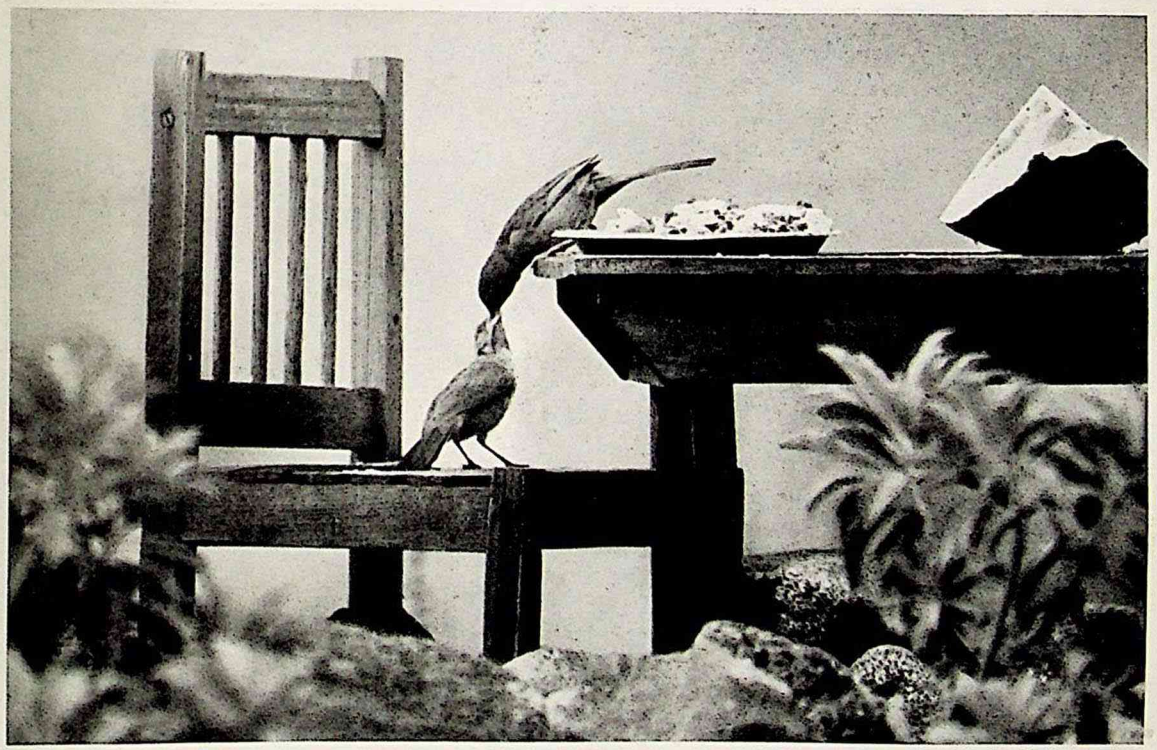
MIXED COMPANY AT THE CANYON CAFETERIA

A skunk and a possum were the first animals of different species to eat peaceably together. Table and chairs have short legs for small guests' convenience.



CALIFORNIA QUAIL SUN THEMSELVES BEFORE DINNER

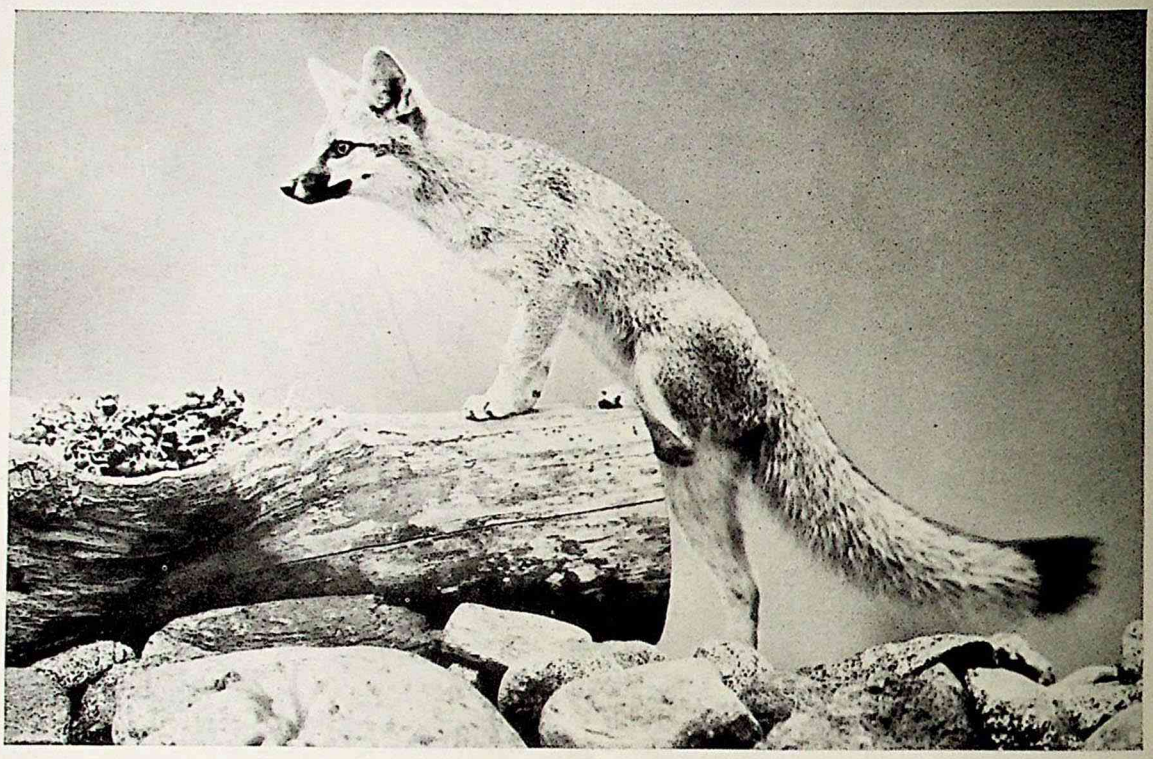
If they find no cracked grain near the animal table at mealtime, these topknotted guests call and fuss like hungry children. The leader, right, wears an aluminum identification band.



© S. R. A.

WHILE BEING "REFUELED," BABY BROWN TOWHEE TAKES A CHAIR

The mother simply turns her head and body to select food for the robust offspring. These birds feed their young till the latter are practically full-grown.



A GRAY FOX THAT KNOWS NO "STRUGGLE FOR EXISTENCE"

With four brothers and sisters, it was born on the steep slope of Eaton Canyon, where human bounty provides food. Just now a fluttering bird arrests its attention.



© S. R. A.

MAMMA RACCOON INTRODUCES HER CHILDREN TO HUMAN FRIENDS

"Each year," says the author, "she brings a fine new family for our approval. We sit in the living room and feed them bananas and grapes through the window."



A HAND-OUT SMELLS LIKE FOOD—

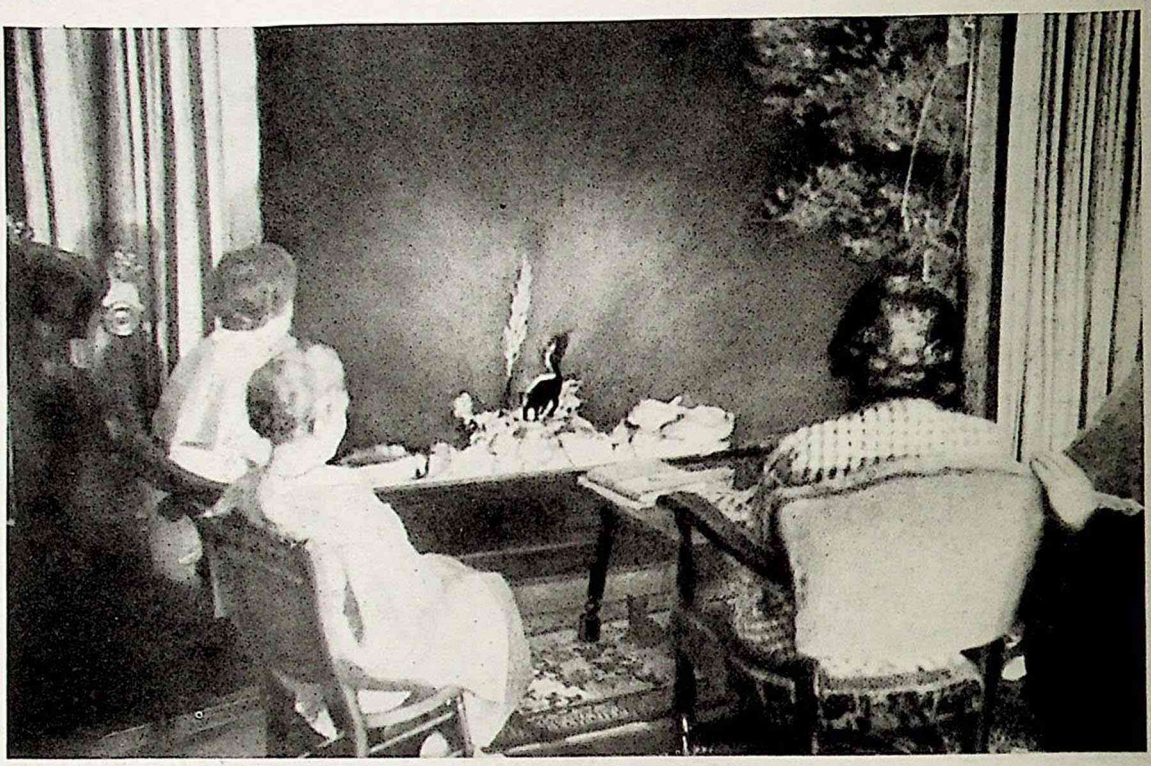
Tail upraised, indicating vigilance, a half-grown skunk pauses three feet from an enticing hand. A polecat's hearing and sight are poor, but its keen nose can be trusted.



© S. R. A.

IT IS FOOD!

Meat canned for dogs is a treat for the Canyon skunks. They eat it from hand or pan. The white stripes of this young fellow's fur suggest suspenders.



LOOKING OUT THROUGH THE VIEWING WINDOW

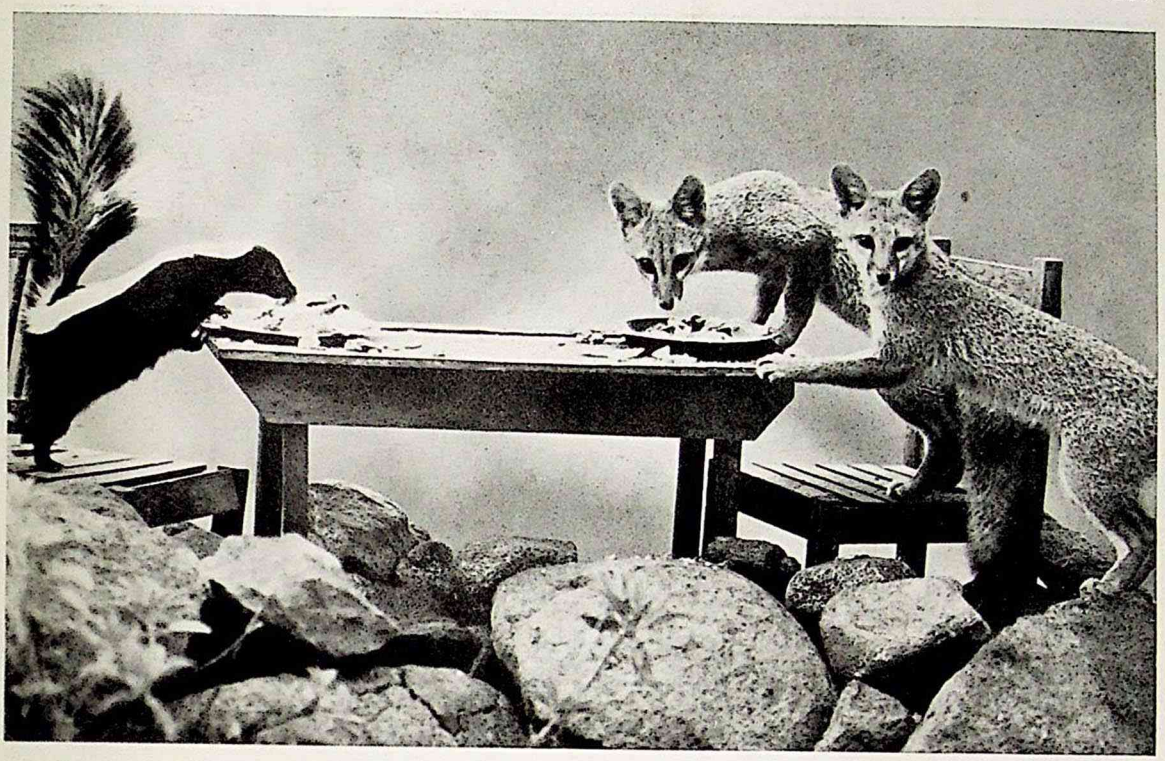
Mrs. Atkinson (left) and friends watch a big skunk at dinner atop the rock feeding wall. Flash bulbs inside and outside the living room gave light for the photograph.



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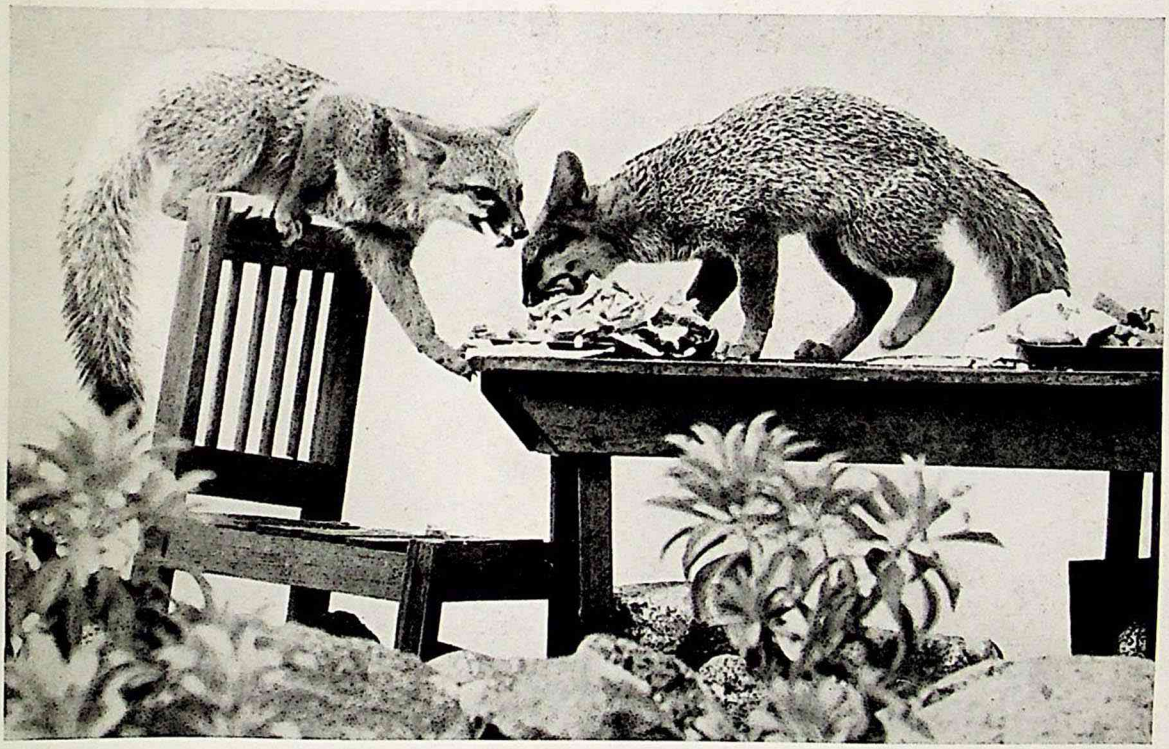
LIKE A PUPPY, THIS FRIENDLY SKUNK BEGS FOR BITS OF MEAT

Having nosed ankles to find its mistress, it dines in this fashion or sits up on hind legs and eats chopped bacon from a silver spoon.



FOXES AT LAST DINE WITH A SKUNK

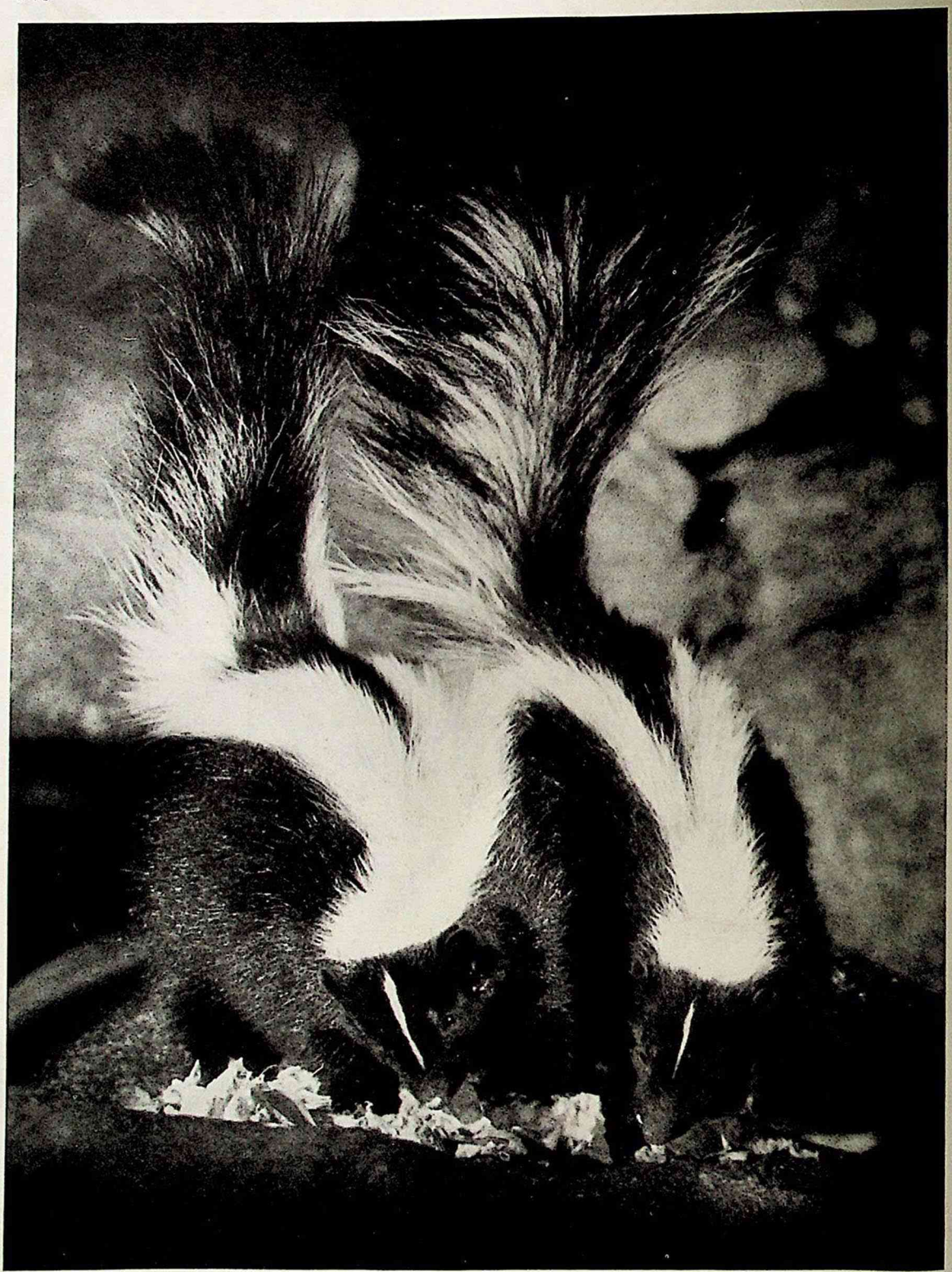
For a long time, the two youngsters were afraid and took their meals alone. Now that the ice is broken, they grow quite accustomed to strange dinner partners. The tin plates are nailed to the table.



© S. R. A.

GOOD TABLE MANNERS DO NOT COME EASILY AT FIRST!

After a few meals, most of the animals learn to sit comfortably or stand on the chairs, forepaws on the table's edge. These gray foxes soon learned the proper etiquette.



© S. R. A.

TAILS FLY HIGH WHEN ANGER FLARES

And what squealing and squirming, what biting and shoving! Yet when these two settled down to eat, they found food enough for both. Skunks seldom fight among themselves except in the mating season; then they go for each other tooth and claw, but without ejecting any scent. If captured young, these animals become as tame and playful as kittens, and the author found them vastly more intelligent and interesting.

arroyo to get food and water from protected feeding stands and bird baths.

No automobiles are allowed in the sanctuary, but adequate parking space has been allotted at the top of the trail. Dogs and cats are barred.

We shall always remember that first night in June, eight years ago, spent in our new home. Weary from moving, we turned out all the lights in the house and quietly sat in the darkened living room behind a big plate-glass window which faced the canyon and gave us an uninterrupted view of Mount Wilson beyond and of the arroyo below.

The full moon cast soft shadows among the friendly shrubbery and rocks. Some of these shadows soon became moving objects. They were the dim forms of two wild gray foxes and a large raccoon stealthily walking about the yard near the big window.

FOOD SCRAPS LEAD TO FRIENDSHIP

The second night, in the hope of making these older inhabitants of the arroyo understand that we were their friends, we placed some table scraps on a large flat stone which extended out from the rock wall.

Night after night, ring-tailed cats, gray foxes, opossums, raccoons, and others climbed the trail to the feeding rock and tested the food. Through the ensuing years these creatures have learned to be friends not only with us, but with one another.

Increasing numbers of these midnight track-makers accept our hospitality. We find ourselves running what one might call an animal cafeteria.

Year by year we watch the strange performances of these fourfoots as they come and eat food from the rock and walk contentedly about our yard. We invite our friends and neighbors to sit with us in darkness behind the big window and witness the unusual and fascinating behavior of the trustful little prowlers that enter the brightness of our outside electric floodlight without the slightest evidence of fear (page 238).

ANIMALS TAUGHT TO USE TABLES AND CHAIRS

This thought came to us: Could we train these animals, without disturbing their liberty, if we made things we wished them to do attractive and desirable?

As an experiment, we fastened a narrow table on top of the rock wall just above the feeding rock. The table was high enough to compel small animals, such as skunks, to exert themselves to reach the top. For their greater convenience, we placed a low chair, without arms, at each end. On the table in front of each chair we nailed a small tin plate and filled it with tidbits of bread, meat, and fruit (pages 234, 235, and 239).

Since there was scarcely room on top of the table for food and animals at the same time, it was easier for the guests to climb into a chair and to eat with their paws on the edge than to stand on top. They soon discovered and adopted this better "sitting" position. Lesson number one!

Next, by placing cakes, candies, and fruits on the inside edges of the tin plates, we induced our pupils to eat the "main course" before indulging in dessert. And that was the second lesson.

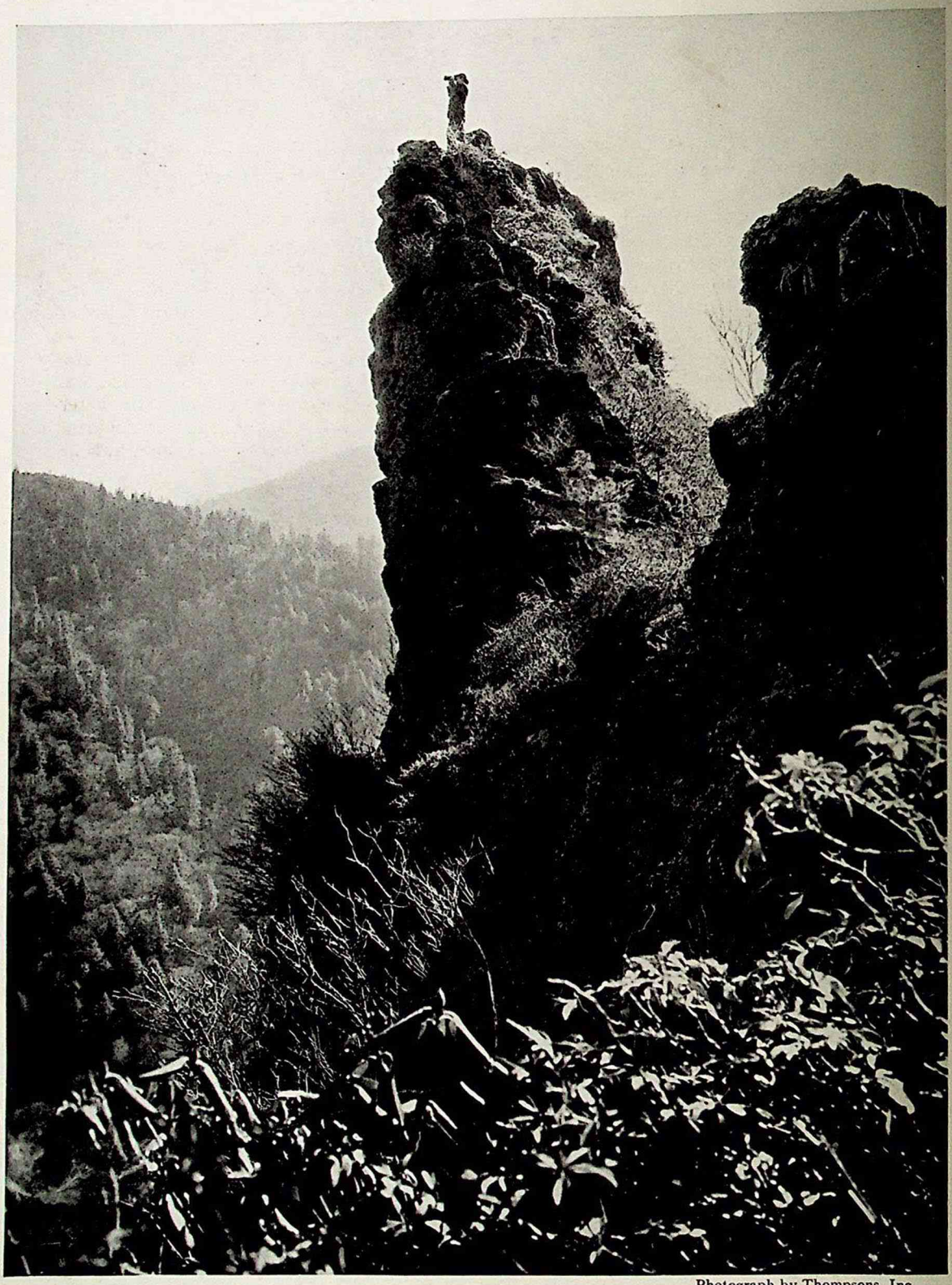
When we used only the flat rock for feeding, no two animals (excepting mothers and their young) would eat together, even with their own kind. After the table and chairs were installed, they gradually relaxed into sociability. General comradeship at the table was first instituted by an opossum and a skunk (page 234).

MOTHERS INTRODUCE THEIR BABIES

Spring and summer months bring to us new adventures. Night after night different mothers introduce their babies to our table. As the babies grow older, they take it for granted that our cafeteria is their natural source of food supply. And they do not always wait until it is dark to come to supper.

Some of the young ones, unafraid of my silent approach, eat from my hand, but baby foxes are an exception. Without much effort I taught one little skunk to sit up on his hind legs like a dog and eat chopped bacon, a skunk's delight, from a silver spoon (page 238).

As the number of young animals has increased, competition has sprung up among them. They vie with one another to see which can be first to arrive at table and get the choicest morsels. This rivalry is so keen that some of them actually wait on the wall as early as three o'clock in the afternoon, their eyes on the kitchen door not far away, an expectant expression on their faces.



Photograph by Thompsons, Inc.

PEREGRINE PEAK EMULATES THE LEANING TOWER OF PISA

Throughout the Park there are old trails that test the stamina of even the hardy mountain folk to whose cabins they lead. A pair of duck hawks, the American form of the peregrine falcon, has nested on the overhanging side for many years, giving the pinnacle its name.

RAMBLING AROUND THE ROOF OF EASTERN AMERICA

By Leonard C. Roy

HAZE-SHROUDED, the Great Smoky Mountains dominate the horizon of eastern Tennessee.

"They look like clouds!" exclaimed my companion, who had traveled nearly the length of the Appalachians but had not seen this, the highest mountain mass in the eastern United States.

Visitors often are amazed to find such lofty, wild, and unspoiled mountains straddling the Tennessee-North Carolina State line (map, page 246).

In 1923, when public-spirited men and women of the two States organized to encompass soaring heights and plunging valleys in a national park, even the mountaineers, grandchildren of pioneers who had braved the arrows of cunning Cherokees, had not explored the whole area.

Adventurous hikers who did invade the mountains found the undergrowth so thick in places that they had to chop their way through it with an ax.

A few naturalists and surveyors visited parts of the Smokies. Hunters sought their quarry amid the stately trees and dense cover that sheltered bears, deer, and numerous smaller animals, and here and there a solitary fisherman whipped a woodland stream for trout.

Revenue officers occasionally tried to penetrate the wilderness, and lumbermen, with dynamite, axes, and saws, pushed their roads and railroads only as far as the most recent cutting. There were areas that few white men had seen.

ONCE A BARRIER; NOW A MAGNET

To business men of eastern Tennessee and western North Carolina, the Great Smokies long were a trade barrier. No road leaped the rugged ridge along which the State line rambles for 71 miles. Commerce east and west in this latitude still moves around either end of the mountains, but the "barrier" now is an asset as the Great Smoky Mountains National Park.

A mountain woman told me that a few years ago it took her more than a week to go to Knoxville and return to her cabin in the hills. She was 28 years old when she first visited the city.

In those days there was little reason for the mountaineer to leave the mountains. A few sheep supplied wool for clothing and the mountain woman was an adept spinner and weaver.

When cows and oxen became useless and were dispatched, shoes were made of their hides. Bears, deer, and birds, brought down with five-foot rifles or caught in traps, supplied the family meat platter. "Sweetnin' " was produced from sorghum (p. 244).

A corn patch, clinging to the steep mountain slopes, yielded meal for cornbread and, in many instances, for the powerful, water-white "corn licker" that was sold for cash, or traded for salt, coffee, and other articles.

"NATURE AT HER CHOICEST"

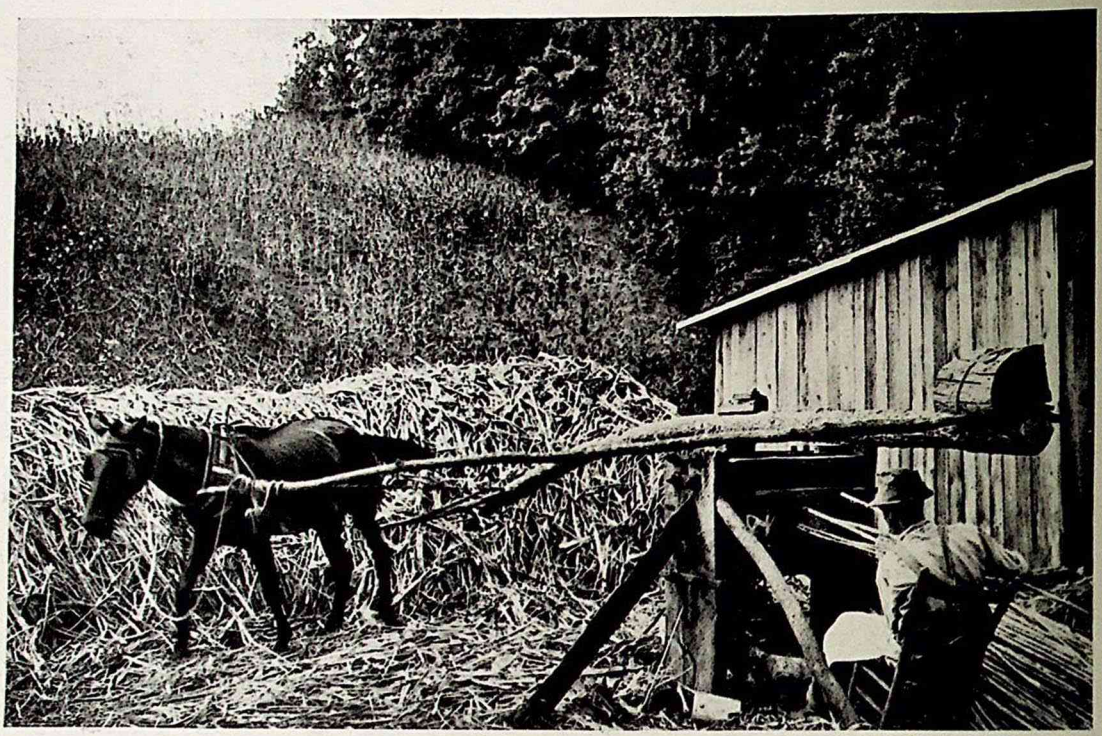
Nearly all the land in the Great Smokies was privately owned when the park movement was initiated. Arrangements had to be made for its purchase before the land could be turned over to the National Park Service for development. An intensive money-raising campaign was planned. Private subscriptions aggregated $1,000,000. Appropriations by the adjoining States brought the fund to $5,000,000.

But this was only one-half of the funds required. The campaigners for many months sought vainly for the other half. Then John D. Rockefeller, Jr., announced that the Laura Spelman Rockefeller Memorial would match dollar for dollar any money raised in the campaign.

In 1926 Congress authorized the establishment of the Great Smoky Mountains National Park on condition that the citizens of Tennessee and North Carolina present 427,000 acres of acceptable land in one solid tract, the acreage to be equally divided between the two States. Officials who had investigated were enthusiastic.

"Nature is at her choicest there," they reported.

Development of the area as a national playground began, and today the thousand resident families have shrunk to about four hundred. Some sold their holdings outright and moved out of the mountains; some sold and took leases for terms of years; some took half the appraised value of their property and were given leases for the remainder of their lives. Only a few landholders have yet to come to an agreement with the Government.



Photograph by Carlos C. Campbell

"GIDDAP" AND "WHOA" HAVE NOT BEEN DISPLACED BY THE PULL OF AN ELECTRIC SWITCH

From dawn till dark dobbin walks round and round, providing the "horsepower" for this sorghum press. Since pioneer days the mountain folk have raised sorghum and squeezed from it in such crude mills a thick, sweet juice used as "sweetnin'." The liquid is boiled down in a near-by open-air vat. Locally called "cane," sorghum is planted and harvested like sugar cane.

Thus, in perhaps two decades, the mountain family may pass from within the Park area. Many mountain folk, however, will live on in the same primitive manner all around the borders of the Park, adding "human interest" to scenic beauty.

For five years now Government agencies under the supervision of the National Park Service have been building roads and trails and restocking forests and streams.

The work is just begun. Only seventy miles of high-standard roads, twenty-five miles of secondary roads, and fewer than 600 miles of trails have been completed. Yet for the last three years this infant of our national park system, not yet dedicated, has been attracting more visitors than any other of our 25 national parks.

SUNRISE IN THE SMOKIES

I had known the Smokies of old, and now, in the summer of 1935, I had come to revisit them.

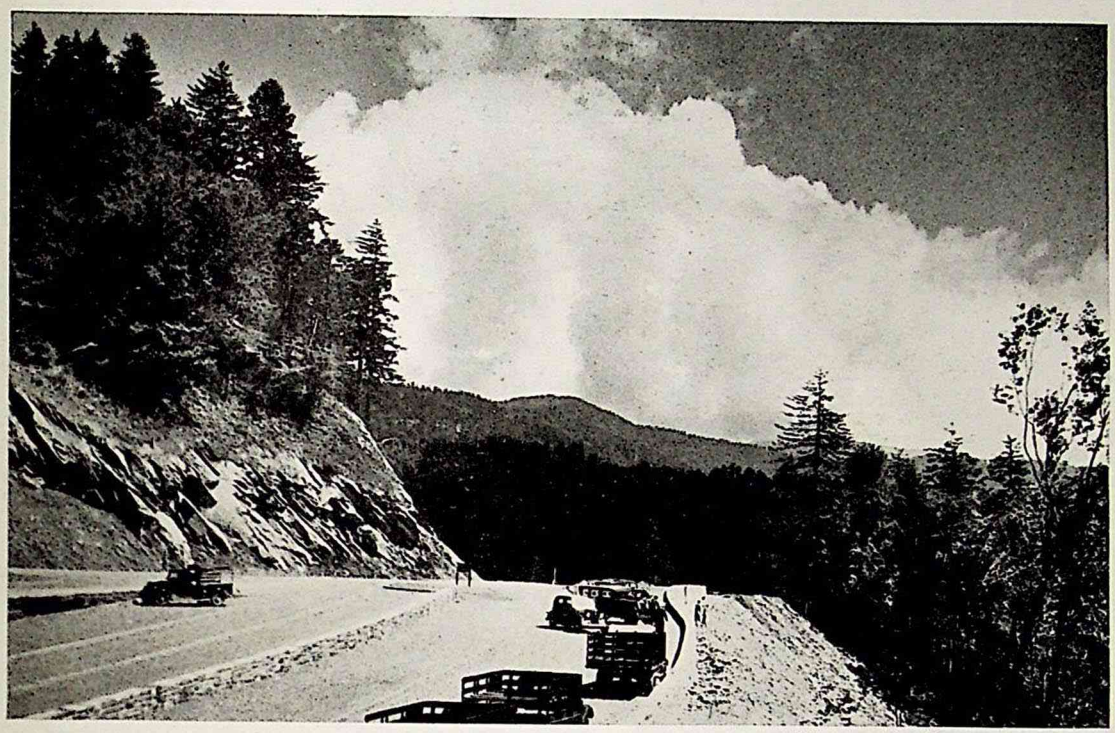
The mountains rose ever higher against the sunrise as we sped over 38 miles of modern highway from Knoxville, Tennessee's gateway to the Great Smokies, to Gatlinburg, nestling in the foothills.

The village was just awakening. A few hikers and horseback riders emerged from the hotels and roadside cabins for a day's outing on the trails. Men born and reared in the hills, drawn to the village by visitors' dollars, hurried to their filling stations to catch the early morning trade.

Proprietors swung open the doors of their curio and craft shops, displaying stocks of linens, rugs, tapestries, furniture, inlaid and hand-carved trays, jewelry and cigarette boxes and book ends—all made by native craftsmen. No one stirred on the broad acres of the Pi Beta Phi Settlement School which, since 1912, has been teaching handicrafts, agriculture, homemaking, and the three R's to mountain children.

Less than a mile beyond the village a white and green sign announced the boundary of the Great Smoky Mountains National Park.

At the end of a long curve, a short dis-



Photograph by Carlos C. Campbell

A "PARKING LOT" ATOP NEWFOUND GAP PREVENTS TRAFFIC JAMS WHEN MOTORISTS STOP TO SCAN THE VIEW

From this point westward, a splendid highway follows the State line nearly to Clingmans Dome. Reaching an elevation of 6,311 feet, the road is one of the highest in the United States.

tance beyond, the highway forked (map, p. 246). We stopped and peered through the diminishing haze at the steep, tree-blanketed slopes of Mount Le Conte and Sugarland Mountain, whose summits were hidden in low-hanging clouds.

As we gazed up, entranced, at the soaring heights buttressed by sturdy ridges, a mountaineer emerged from a roadside path, a sack of cornmeal straddling his right shoulder.

"Which road leads to Newfound Gap?" I asked.

"Thet un," he said, pointing to the left fork, "and thet un to the gorge."

SPEECH OF PIONEER VINTAGE

The mountaineer's clear-blue eyes stared from a ruddy, bewhiskered face, under a dusty, black felt hat. His overalls were patched and his shoes thick-soled. His language had changed little from the homely speech of his pioneer forbears who migrated to the Great Smokies from North Carolina and southwestern Virginia before the Civil War.

Up ahead, I knew, engineers were widening the road to Newfound Gap and eliminating curves by tunneling through massive ridges.

"How far up the road is the construction work?" I asked the obliging native.

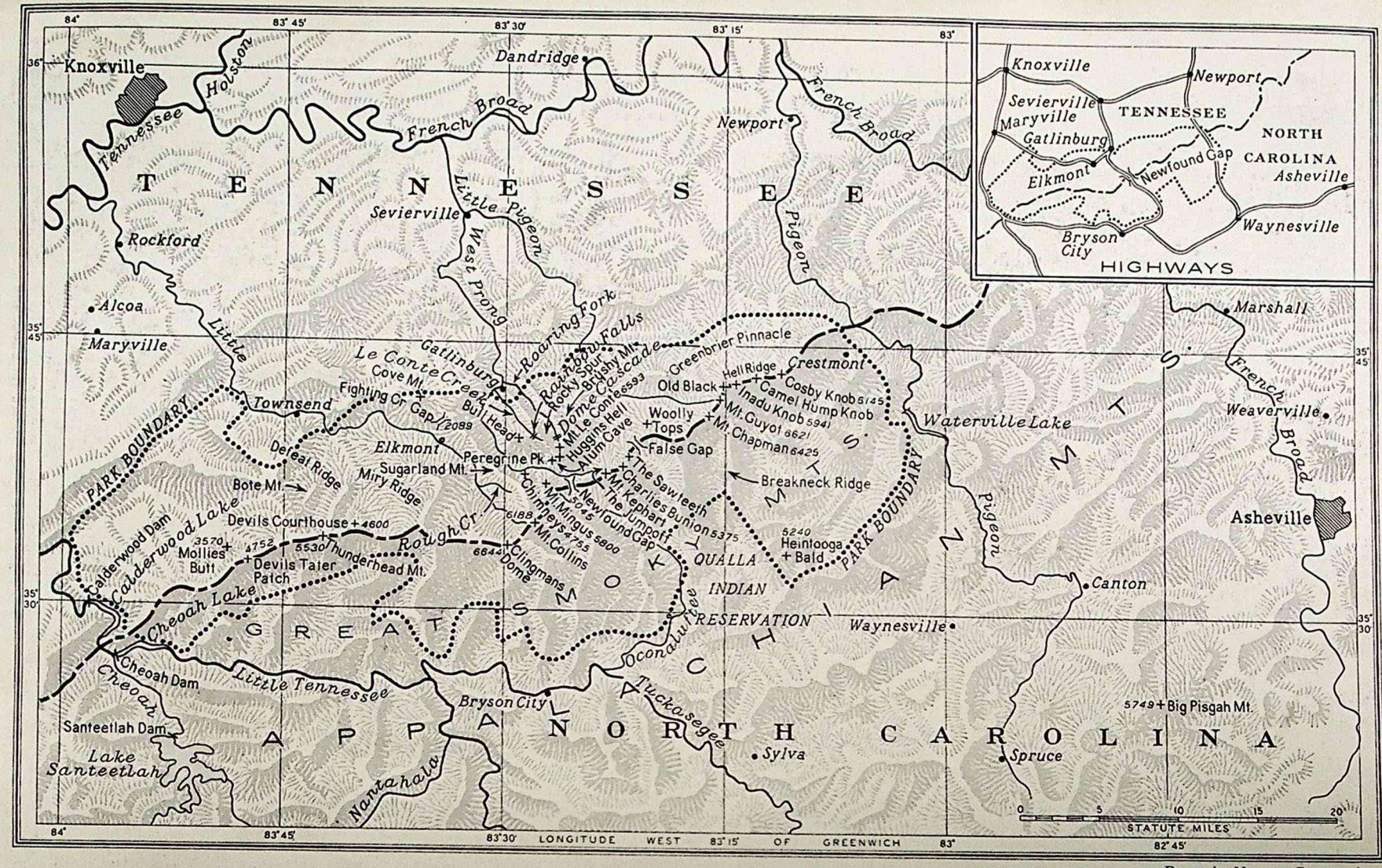
"Hit's a fur piece, stranger. Hit's a leetle rough up thyar whar them men's aworkin', but I reckon hit's safe enough to git past," he drawled.

While talking to the mountaineer, I was inspecting the oil supply of my automobile. He peered over my shoulder as I withdrew the oil gauge, and said:

"Hit ain't hurtin' none for grease."

Along this road, the only modern one over the mountains between Tennessee and North Carolina, we wound through the scenic valley of the West Prong of Little Pigeon River, crossing and recrossing the stream to the State line at Newfound Gap.

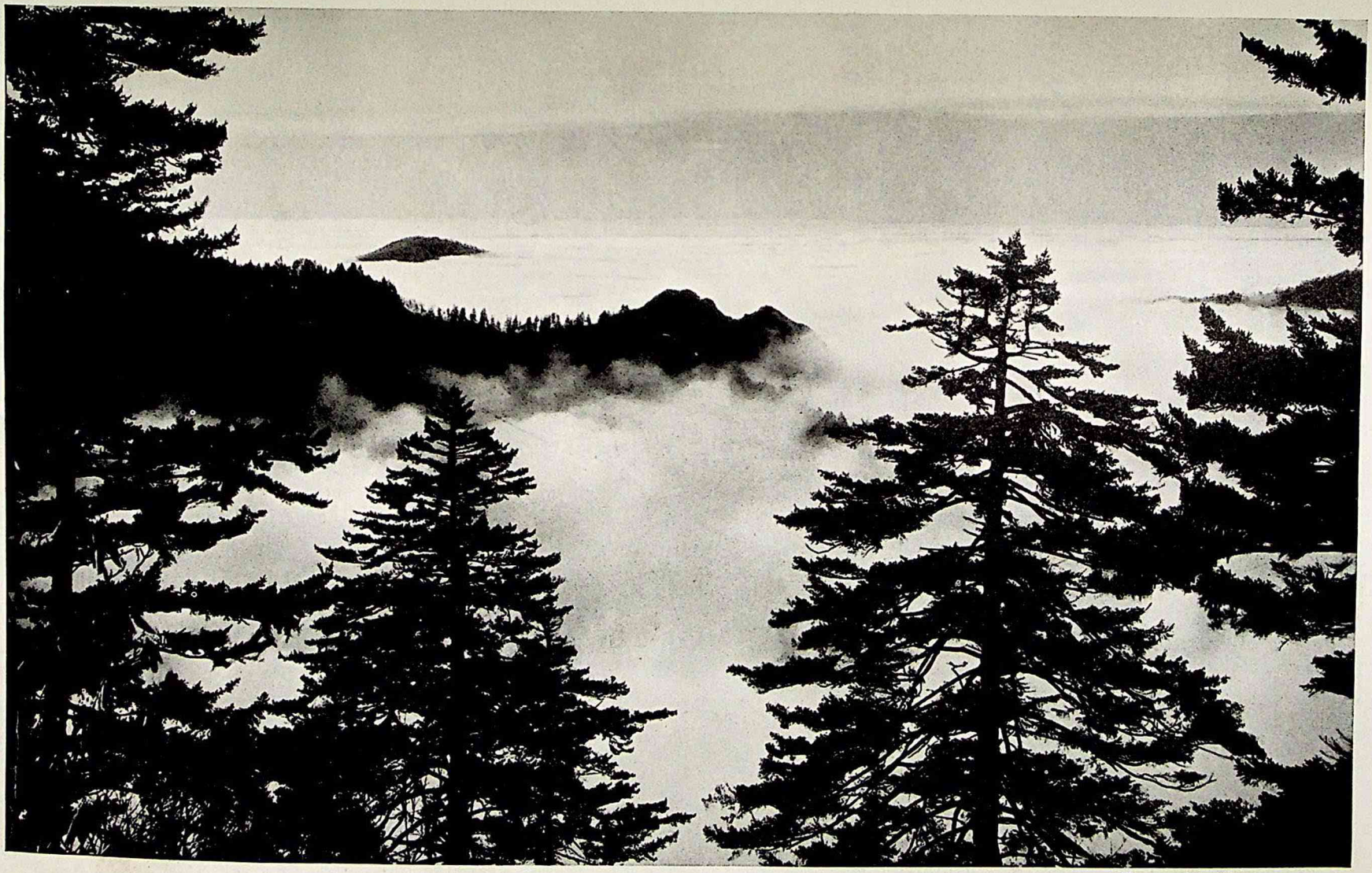
With each well-banked curve a new panorama was spread before us. Seen from one lookout, before the road enters a deep gorge, Mount Le Conte soars above a sweeping valley, a checkerboard of various tints of green; here are the inevitable corn patches of mountain families who have



Drawn by Newman Bumstead

ABOUT EVENLY DIVIDED BETWEEN TENNESSEE AND NORTH CAROLINA, THE GREAT SMOKY MOUNTAINS NATIONAL PARK EMBRACES 427,000 ACRES OF RUGGED HEIGHTS AND DEEP VALLEYS

"Rooftop of Eastern America" the Smokies have been called, because more than a score of peaks rise over a mile above sea level. Clingmans Dome (6,644 feet) is only 40 feet lower than Mount Mitchell in near-by North Carolina, the highest peak east of the Mississippi. The inset shows main roads leading across the Park, which is within twenty-four hours' automobile or train ride of half the population of the United States.



Photograph by Thompsons, Inc.

WHEN CLOUDS LIE LOW, LOFTY PEAKS BECOME ISLANDS IN A BILLOWY SEA

Although the blue-gray haze, which gave the Great Smokies their name, and clouds often harass photographers, they soften panoramas and make fantastic settings. From the crest of Mount Mingus in Tennessee, the twin peaks of the Chimneys appear in the center (page 248) and the "island" of Sugarland Mountain in the background. A ridge of Mount Le Conte thrusts into the picture at the right.



© Thompsons, Inc.

RAINBOW FALLS BOWS TO JACK FROST

But in the spring this 84-foot cascade leaps from a bower of purple rhododendron. Here ice "stalactite" and "stalagmite," caused by a temperature of 15 degrees below zero high up in the mountains, seek to unite in one vast sheet.

been permitted to remain temporarily in the Park area; there are abandoned farms, grass-grown and studded with young trees that not long hence will return those patches to the forests whence they came.

THE CHIMNEYS ARE THE SENTINELS OF THE HIGHWAY

The Chimneys, rugged twin peaks, thickly forested, stand like sentinels, guarding the bridge which carries the highway across the West Prong (page 247). From the bridge all the way to Newfound Gap we were hemmed in by steep, wooded mountain slopes, unbroken except where a waterfall, too high above us and too far away to be heard, gleamed in the sun like a white silken ribbon as a mountain stream swept over a precipice toward the noisy river cascading below.

At Newfound Gap along the State line the mountain top has been excavated and space provided for parking several hundred automobiles (page 245). Here the arboreal wonderland that is the Great Smokies spread before us in both States.

From this point the highway descends into North Carolina along the Oconaluftee River, through the Qualla Indian Reservation, toward Asheville and Bryson City, North Carolina gateways to the Park.

In the next few weeks our travels carried us across the "waistline" of the vast Park area, completely around its circumference, and deep into the wild interior.

Southwestward from the Gap, the Skyway, one of the highest highways in the country, is taking shape. It has been completed nearly to Clingmans Dome, the loftiest peak in the Great Smokies. Ultimately it will wind forty miles over and around peaks along the State line until it reaches the western end of the Park, affording amazing vistas of jumbled mountains and billowy valleys. Portions of the Skyway are already 6,300 feet above sea level.

The eastern half of the Park will remain a wilderness, except for a minimum of trails and foothill roads for fire protection. A woodland path follows the State line, forming an important link in the 2,000-mile Appalachian Trail from Maine to Georgia.

It is along the trails that the hiker meets isolated mountain families in their cabins, and stumbles upon the remnants of abandoned mills that not long ago ground out the mountaineers' "turn" of cornmeal.

Hiking in the forest near Cove Mountain, far from the main road, I came upon

a lonely cabin. Three sisters were paring apples, gathered from a few scraggly trees that shaded their porch. Their speech was more modern than that of many mountain people who had closer contact with "furriners" (as all outsiders are called), because, unlike some of their neighbors, they attended a log schoolhouse near by.

In other respects, however, they were as independent as any mountain folk I saw. Their cabin was the crude, clay-chinked, log type, with mountain-made furniture and equipment.

"We still weave our winter clothes, but we buy this," one of the sisters said, pinching the blue denim apron that concealed her ankles.

A HOME-MADE MOUNTAIN HOME

Everything I observed in and around that cabin was home-made, except the denim, a bit of frayed newspaper attached to a swinging fly-chasing apparatus over the dining table, a few enamel cooking utensils, a gaudy "ad" for a medicinal cure-all, a mattock, and an ax. Their trundle beds, high-backed chairs, spinning wheel, and loom had been made by their father a quarter-century or more ago.

At another cabin in that neighborhood I found a hoe fashioned from a piece of wagon spring picked up on a mountain road, and a knife that had been hammered out of a saw blade salvaged from the debris of an abandoned lumber camp.

Not far from Gatlinburg one hot afternoon, I explored a narrow lane to a cabin in a grove of trees surrounded by fields of tall corn, sorghum, potatoes, and beans. Under a spreading oak near the cabin a mountaineer was dozing, a smoke-blackened corncob pipe hanging from his lips. A clear mountain brook, a few yards away, sang its perpetual lullaby.

Our host awoke as we approached. His wife, thin and stooped, also with pipe in mouth, emerged from the cabin door and took a seat near us.

"Is your land in the Park?" I asked the mountaineer.

"The back piece of hit was, but I sold hit to the Gov'mint," he said.

"Did the Government pay a good price?"

"Tolable," he replied.

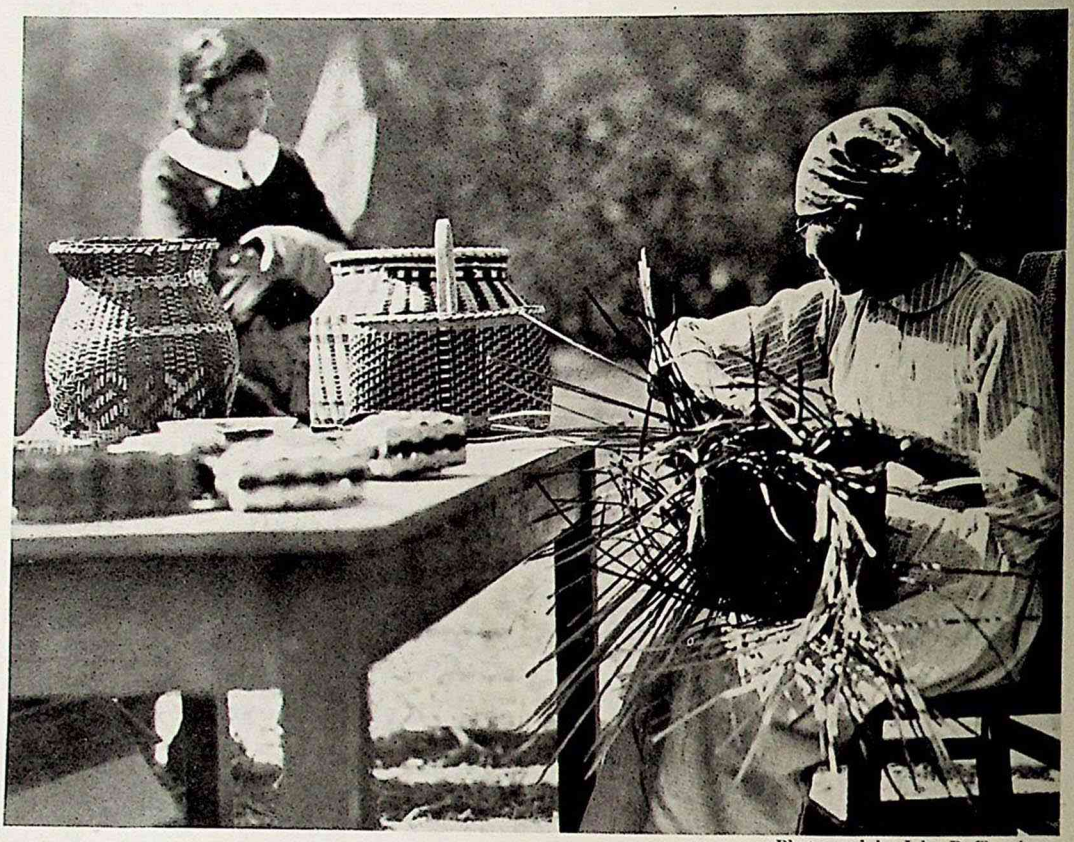
The mountaineer admitted that the growth of Gatlinburg and the Park visitors had given him a market for all the honey, corn, chickens, and potatoes he could produce, yet he seemed not quite content.



Photograph by Thompsons, Inc.

GIANT OF A FOREST PRIMEVAL

In coves and gorges grow big tulip trees. Some were old when Sir Walter Raleigh set foot in North Carolina. Many trunks measure six to seven feet in diameter, with lowest branches 100 feet above ground. Yellow blossoms resemble tulips.



Photograph by John D. Topping

DEFT FINGERS WEAVE BASKETS FROM RIVER REEDS, CANES, AND WHITE OAK SPLINTS

Thirty-two hundred Cherokees live on the 63,000-acre Qualla Indian Reservation on the southern slopes of the Great Smokies, adjoining the Park. The men cling to native games and the women carry their papooses astride their backs in true Indian fashion (pages 264 and 266).

I suggested that he might be like the Smoky mountaineer who moved when a family settled within ten miles of his cabin because the newcomers were too close. He chuckled, as if in agreement.

"GOOD OLD MOUNTAIN RIFLES"

One morning I visited a summer colonist at Gatlinburg whose hobby was collecting mountain rifles. He was enthusiastically fondling a newly purchased five-foot flintlock when a freckled, red-haired mountain boy approached the cottage and handed him a penciled invitation to a "shoot." The host promised "plenty of mountain music and watermelon." I was invited, too.

I saw mountain boys who had not reached their teens hitting the bull's-eye with hog rifles longer than they were tall, rifles whose leaden bullets were larger than peas (page 265). And mountain men who had passed their threescore and ten seldom missed a target. I was convinced that had the National Park Service not spread its protective net over the mountains, the few remaining wild animals would soon have fallen before the mountaineers' deadly aim.

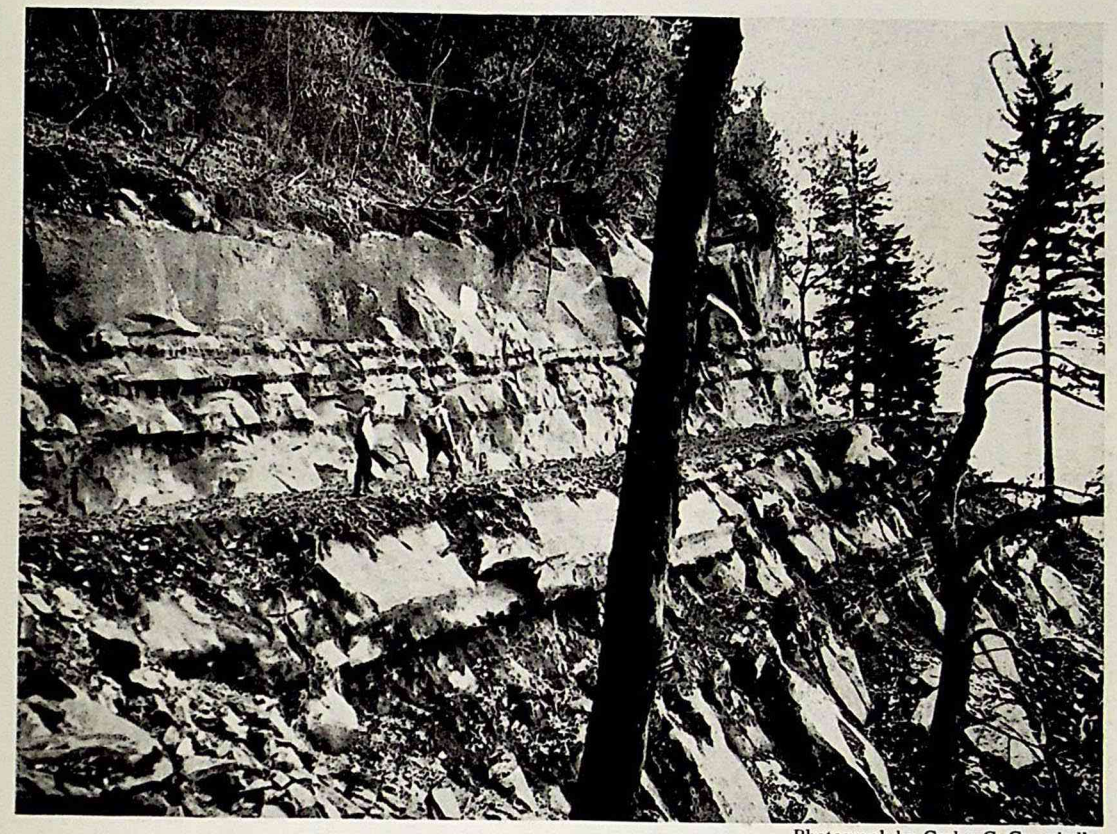
Between shots, mountain music filled the valley. Some of the ballads I had heard; others originally were brought from the Old World by early pioneers and have been handed down to the present generation.

"Lord Thomas and Fair Elender," a folk song of England, traced back to the time of Chaucer, is a favorite. In the mountain cabin or at a "music makin'" in a Great Smoky village you may hear:

"O mother, O mother, come rede me a riddle,
Come riddle it both in one,
Whether I shall marry fair Elender,
Or bring the brown girl home.

"The brown girl, she has house and lands,
Fair Elender, she has none;
Therefore, dear child, under my consent,
Go bring the brown girl home.

"He dressed himself in scarlet red;
His waiters all in green;
And in every town that he rode through
They took him to be a king."



Photograph by Carlos C. Campbell

C.C.C. TRAIL BUILDERS USE ROCK STRATA TO ADVANTAGE

Construction of the well-planned system of trails, that cross and recross streams, skirt scenic spots, and lead to lookouts, often required blasting through solid rock. In addition to the new four-foot trails like this one, there are hundreds of miles of primitive, ungraded paths, known only to mountaineers.

Many other verses describe the associations of Lord Thomas with "fair Elender" and "the brown girl."

"GRANDSTAND OF THE SMOKIES"

Early one morning in late June several years ago a companion and I left Gatlinburg with a capable guide to scale Mount Le Conte. "Grandstand of the Smokies" it is often called, for more people have scanned the surrounding mountains from its summit than from any other peak in the range.

For a mile or more the trail was easy. Then, suddenly, it seemed that it leaped straight skyward. At times we found ourselves reaching for a finger hold in a higher rock as one reaches for the upper rung of a ladder.

No mountaineer would permit his horse to attempt that route. A slip would mean injury or death. Only the glory of the Rainbow Falls, its waters leaping over an 84-foot cliff out of an arbor of purple rhododendron, beds of flame azaleas, phlox, and galax, inspired us to carry on to the summit.

When at last we reached the top, the view amply rewarded us. In the distance rose the rounded, tree-covered crown of Clingmans Dome, which is just 40 feet lower than Mount Mitchell in the Black Mountains of North Carolina, the highest mountain in eastern America.

Fleecy clouds hovered about the upper slopes of Mount Guyot, the Smokies' second highest peak; Mount Kephart, and Mount Chapman, named in honor of Col. David C. Chapman of Knoxville, Tennessee, recognized father of the Great Smoky Mountains National Park.

The blue-gray haze of the Smokies, which gives them their name, swathed the summits of more than a score of peaks that rise over a mile above sea level (pages 246 and 247).

That jagged part of the State line ridge called The Sawteeth resembles a bit of the Rockies in form, but, like all the Great Smoky Mountains, it is covered with the variegated green of trees and shrubs.

Mount Le Conte still is a grandstand, but many other peaks are becoming more and more popular as new trails and highways are completed. The old Mount Le Conte trail is seldom used except by the hardy mountain climber who seeks to test his strength and lungs.

Four graded trails, each four feet wide, now lead to the summit. Engineers saw to it that one of them passed the famous Rainbow Falls and numerous cascades of Le Conte Creek as the route, a few miles longer than the old trail, winds up the slopes.

Climbers usually take two days for the round trip from Gatlinburg to the top of Mount Le Conte, spending the night at the summit in a tiny log village maintained under Park regulations by a concessionaire.

HIGH HEELS ON HIGH CLIMBS

The early riser on Le Conte may see the lifting of the clouds from sweeping, dew-drenched valleys and the gorgeous sunrise whose grandeur observers have proclaimed far and wide. Horses negotiate the new trails, and I even saw two feminine hikers who had climbed to the summit in high-heeled shoes. A single blister was their only casualty.

Mountain climbing in midsummer is hot and strenuous sport, but in the Great Smokies the builders of the new trails have sought easy grades, and thick foliage provides cool shade. In some places the trails have been literally tunneled out of the thicket.

On a hot, humid day my companion and I set out for the summit of Thunderhead, 5,530 feet high. When we alighted from our automobile where the trail began, old Sol dealt us relentless blows. But less than a hundred yards ahead we stepped into a verdure-framed path resembling a narrow gothic passageway in the crypt of an Old World cathedral.

Only the hushed thud of our footsteps on the soft, moist ground, the trickle of numerous springs, the rustle of millions of leaves, and the songs of the mountain birds broke the silence of that forest aisle.

We found the top of Thunderhead a "bald"—an area devoid of trees but supporting a healthy growth of knee-high grass. As we stood on the sun-swept summit, we saw three rainstorms pour their torrents into the mountains of Tennessee to the north, and one into those of North Carolina to the south. Thunder roared all about us, but not a drop of rain fell on Thunderhead.

To see the Great Smokies from Heintooga Bald, in North Carolina, we motored along the bed of an abandoned logging railroad. Heintooga rivals Mount Le Conte in spectacular mountain views, for, as far as we could see, mountains soared and tumbled—mountains in haze, mountains in clouds.

Panoramas of the Great Smoky heights are ever changing. On a trail one afternoon I stopped to rest. Greenbrier Pinnacle, topped by a fire tower, loomed in the distance, shielded only by a slight haze.

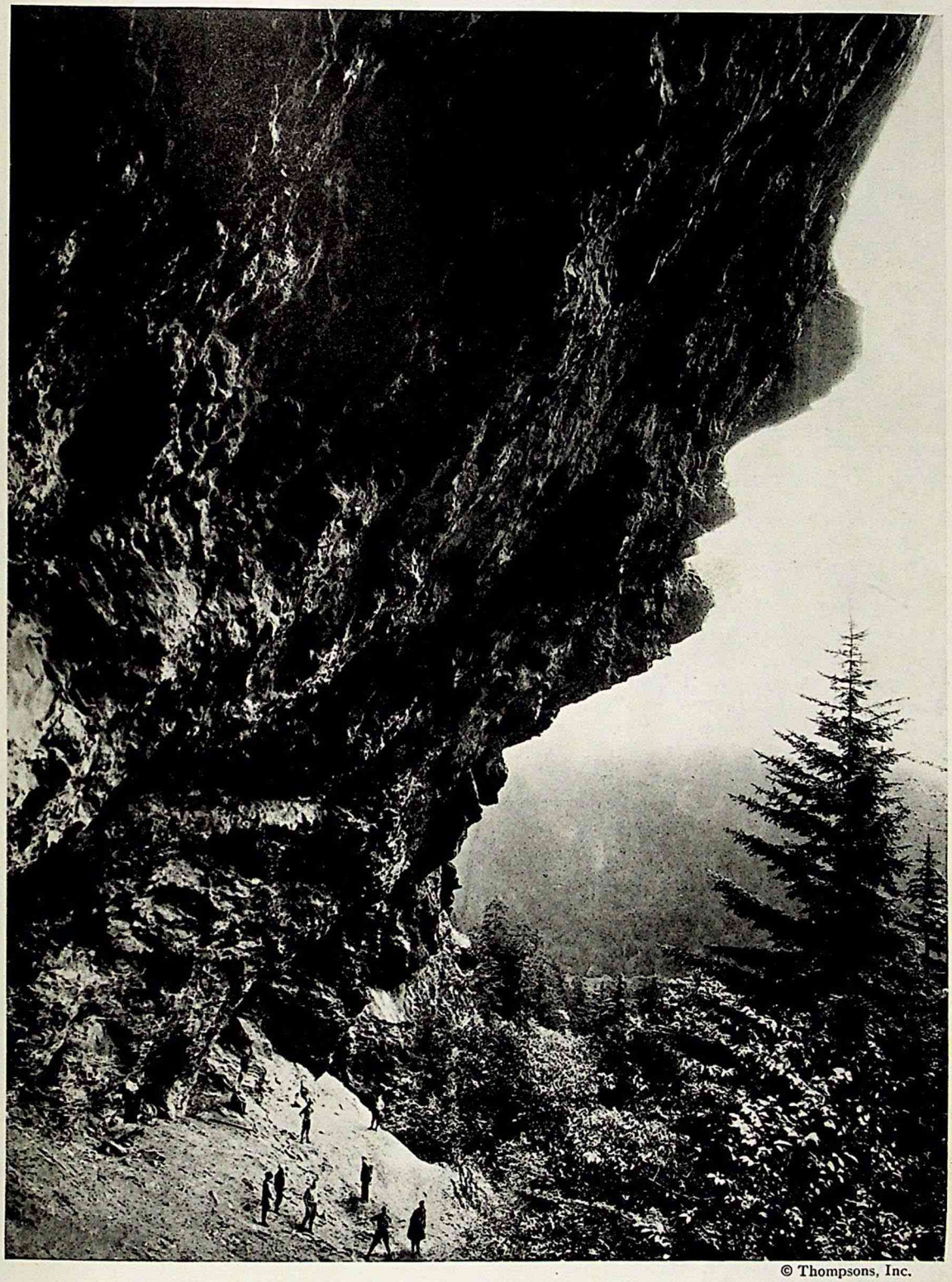
In ten minutes fleecy clouds had hidden its summit, and then lifted to leave the crest again clearly silhouetted against the sky. Spectacular is the view when peaks shade canyonlike valleys and shadows of tiny clouds chase one another on the sweeping slopes above the glens.

One of the first known white men to study the wonders of the Great Smoky Mountains was a botanist, William Bartram, of Philadelphia, who climbed among these heights about the time patriots in Independence Hall signed the Declaration of Independence. After him came other botanists who have found the mountains their paradise, one of the largest and last vestiges of the native forest that swathed the hills and valleys of colonial America.

A CENSUS OF WILD FLOWERS

So diversified are the wild flowers of the Great Smokies that visitors from many sections of the country find species that grow abundantly in their fields and woodlands among others that are rare to them. Twenty-two orchids find a natural habitat in these rugged and well-watered mountains; there are 50 kinds of lilies; 7 of trilliums; 22 of violets, and 5 of magnolias.

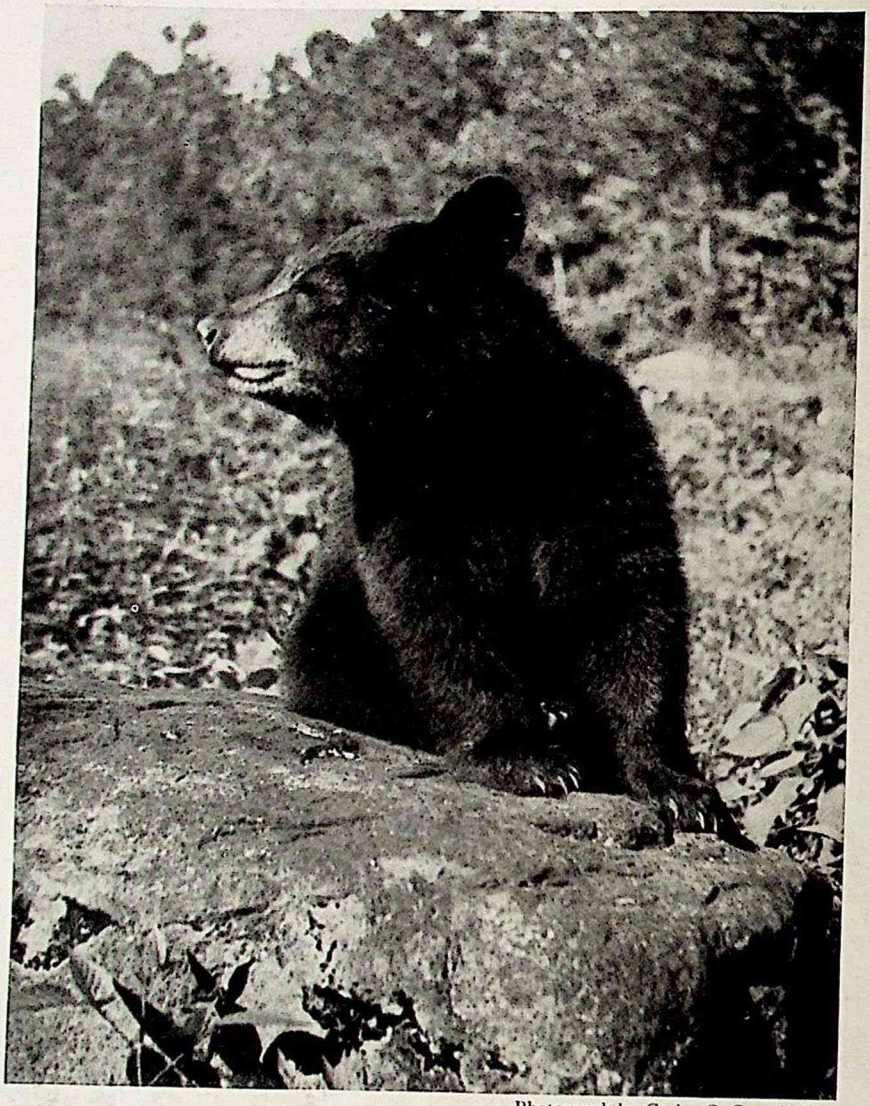
The native wild orchids, while not so large as the more familiar cultivated species, have all the exquisite form and dainty coloring of their "civilized" cousins. Like many other plant families in the Smokies, the orchids are found throughout a long blossoming season. Certain species make a bold debut in the very early spring;



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HIKERS PAUSE UNDER THE OVERHANG OF ALUM CAVE BLUFFS

Turned upside down, this photograph more nearly resembles a contour in the Great Smokies! During the Civil War, saltpeter was mined here on a small scale. The bluffs are a favored observation point from which to view autumn coloring. The foot trail from Newfound Gap Highway to the top of Mount Le Conte passes this spectacular spot.



Photograph by Carlos C. Campbell

BRUIN'S SWEET TOOTH LED HIM FROM THE WILDERNESS

This black bear, about eight months old and weighing 100 pounds, was captured by Elkmont C.C.C. boys by smearing honey on a rock. Now and then campers report nocturnal visits, but the bears usually inhabit the forests. Too slow and clumsy to keep out of rifle range, the bears were rapidly becoming extinct when the Park Service stopped hunting in the area.

others appear reluctant to yield sway to chilly autumn.

Ferns range from the most delicate, with lacy fronds, to the most hardy types. There are lush carpets of mosses and lichens of many varieties, and hundreds of mushrooms and other fungus species range from almost microscopic sizes to the large and showy varieties, many of which are prized edibles.

More than 1,500 species of plants, shrubs, and flowering trees blossom before the first day of June. Rarely in my wanderings did I see spots that Nature had not clothed with tree, shrub, grass, or all three. Scars left by man's assaults are soon obliterated by a blanket of verdure.

Here the catawba rhododendron is at its best. In late June and July, its white and purple blossoms cover whole mountain spurs, fleck sweeping slopes, and envelop trails and streams. Mountaineers call rhododendron and laurel thickets "slicks" and "hells." Indeed, the plants grow in such tangled masses in some areas that only wilderness animals can get through them.

Huggins Hell, covering about five hundred acres, is one of the largest rhododendron and laurel thickets. It was named for Irving Huggins, a mountaineer who sought to drive his cattle from one mountain to another. On the way he was trapped in the Huggins Hell area. It took him several days to find his way out. Mountaineers avoid the "slicks," identified by such colorful names as Devils Tater Patch, Devils Courthouse, Woolly Tops, and Breakneck Ridge.

The Brushy Mountain Trail in August revealed to us that the floral display of the Great Smoky Mountains does not reserve all its beauties for spring and fall.



Photograph by H. M. Jennison

WHEN A BOTANIST COMES ACROSS A SHRUB WITH A STEM 82 INCHES IN DIAMETER, AND HUNDREDS OF YEARS OLD, THAT'S NEWS!

Favorable weather and soil conditions are conducive to luxuriant vegetation in the Great Smokies. This mountain laurel is an example; its limbs are as large as small trees. A holly with a trunk three feet in diameter and a grapevine with a stem more than five feet in circumference are recorded. Wild cherry trees three and four feet in diameter are so numerous in one region that natives call it "Cherry Orchard" (page 257).

The rhododendron, dogwood, violet, flame azalea, bluet, trailing-arbutus, iris, columbine, wild geranium, and ladyslipper had lost their blossoms, but along the trail we were never more than a few steps away from some blossoming plant.

A FRONTIER OF BOTANY

White and pink phlox and brilliant red cardinal flowers vied with yellow goldenrod, goldenglow, and coneflowers, blue harebells, orange and lemon touch-me-nots, delicate purple, white, and yellow passion flowers, and yellow-fringed orchids.

In the area is the largest and finest stand of virgin hardwood in the United States, as well as the largest virgin stand of red spruce.

Trees and shrubs characteristic of Tennessee, North Carolina, and southern Canada grow here on the slopes of the same mountain, at different altitudes.

One hundred and thirty-two known



Photograph by Carlos C. Campbell

A CARRY-OVER FROM PIONEER DAYS IS THE SLED

Trucks, tractors, and wagons have not yet elbowed from mountain roads such practical conveyances, which slide over rough trails and need no brakes. Wheeled vehicles are still useless in many sections where crops are raised on steep slopes. Ox teams now are rarely seen.



Photograph by Thompsons, Inc.

THIS FAT GAMESTER HAS MADE ITS LAST STRIKE IN LITTLE RIVER

Six hundred miles of clear, cool trout streams dash down from the Great Smoky heights. Nearly "fished out" when the Government took possession of the Park, rivers have now been restocked, assuring lively sport and a good catch (page 260).



© Thompsons, Inc.

THICK FOLIAGE HIDES 75 HIKERS ON THE KNIFELIKE RIDGE OF THE CHIMNEYS

These twin peaks rise near the Newfound Gap Highway, a "crossover" from Tennessee to North Carolina. From here unfolds a magnificent panorama of the wild eastern portion of the Park, which, except for trails, will always remain in its natural state. Beyond the pinnacle is the State line range that forms the backbone of the Park.

species of trees have been identified in the Park area—so I wrote, correctly, after my visit. Later I had news there were 134; two months later there were 136. Now there are 138 on the list. The Park still is a frontier of botanical exploration.

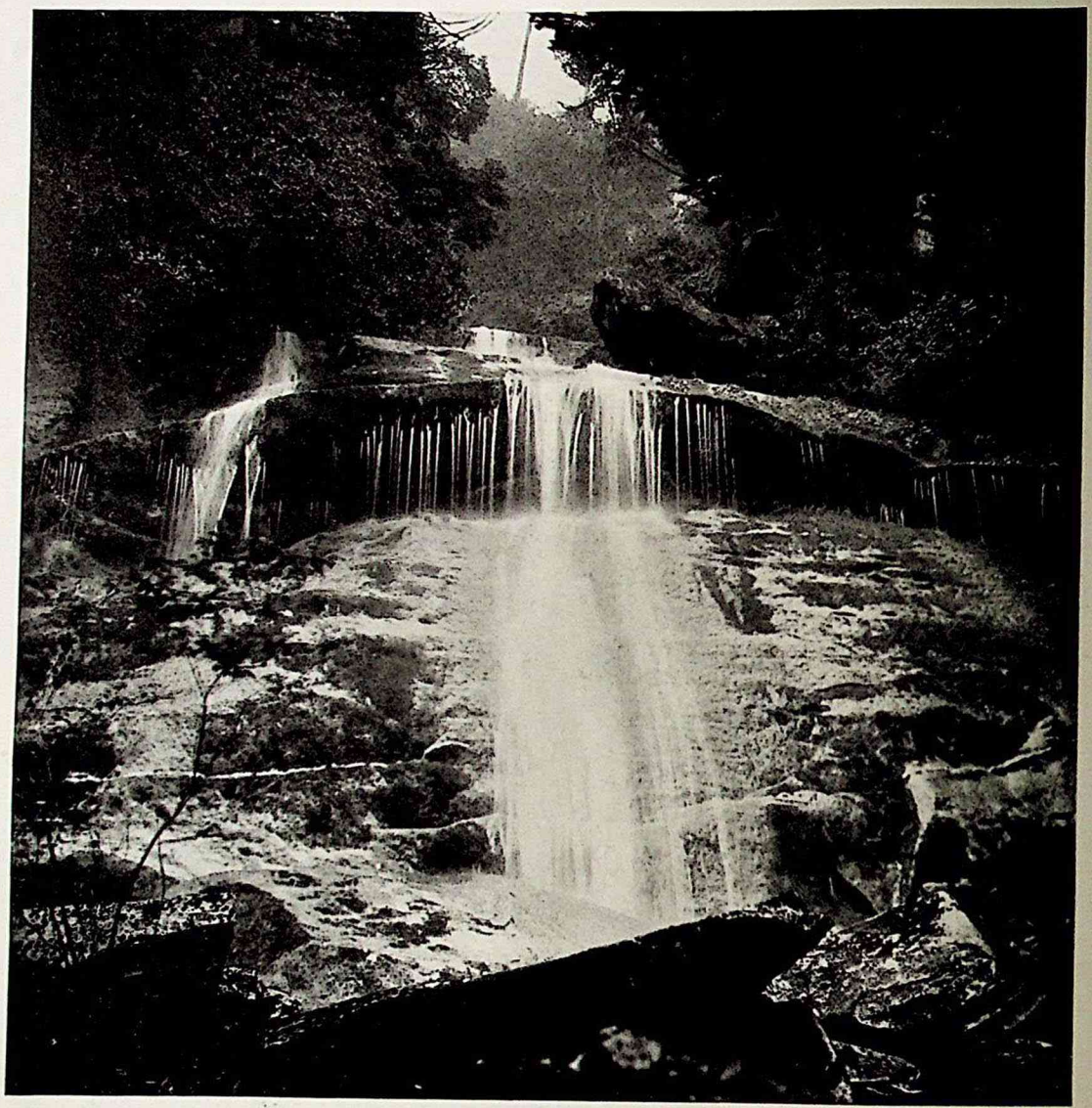
On the lower slopes we passed through forests of sycamore, tulip tree, ash, gum, oak, cherry, elm, basswood, flowering dogwood, and pine. We saw hemlocks that rival in size the famous hemlocks of the western slopes of the Canadian Rockies.

Gaining altitude we were among the beeches, buckeyes, hickories, and birches, and then, near the summit, we stepped into a zone where hardy balsams and red spruce dominate dwarfed species of some of those trees seen below.

Lumbermen had wielded their axes on about half the area before proponents of the Park could stop them. In the uncut half is the forest primeval, where trees of tremendous girth thrust their crowns above shrubs that in some places are as large as trees. Here tulip trees grow six and seven feet in diameter (page 249). Mountain laurels 18 inches thick and as high as a two-story building are not uncommon, and one having a buttress 82 inches in diameter and limbs 12 or more inches through recently was found (page 255).

The main stem of one grapevine in the Park area is more than five feet in circumference.

In autumn the gaudy reds of the maples, sourwoods, black gums; the rich golds of the birches, beeches, tulip poplars, hickories, basswoods, and the few remaining chestnuts; the russets of the oaks; and the varying shades of green contributed by the



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DOME CASCADE IS THE OPENING ROAR IN ROARING FORK

The wind may cease to rustle the leaves and birds may now and then be beyond earshot, but the plash of the mountain stream plays a perpetual symphony in this bowlder-strewn channel on the north slope of Mount Le Conte. The falls are the uppermost of twelve near Gatlinburg, Tennessee. The waters of the Great Smokies flow 1,600 miles, by way of the Tennessee, Ohio, and Mississippi Rivers, before they reach the Gulf of Mexico.

evergreens, suggest that Mother Nature, unable to decide upon a color pattern for this annual spectacle, emptied her paint pots playfully over the mountainsides.

No matter where one goes in the Great Smokies, one is never beyond the murmur of streams, the splash and dash of cascades, or the roar of falls, as the mountain waters flow toward the Tennessee River and thence to the Ohio, the Mississippi, and the Gulf of Mexico.

There are temporary camping grounds on the banks of streams teeming with trout. At one camp site in the gorge of the Little River we spent a pleasant hour in the shade of big trees, chatting with families of the canvas village. Permanent sites will be established for campers with tents, while others will be accommodated in cabin developments. Mosquitoes are conspicuously absent, because there is no standing water.

There are more than six hundred miles of trout streams in the mountains. Some, easy to reach, had been fished out until



Photograph by Carlos C. Campbell

WITH A CYCLOMETER A HIKING CLUB MEMBER MEASURES HELL RIDGE

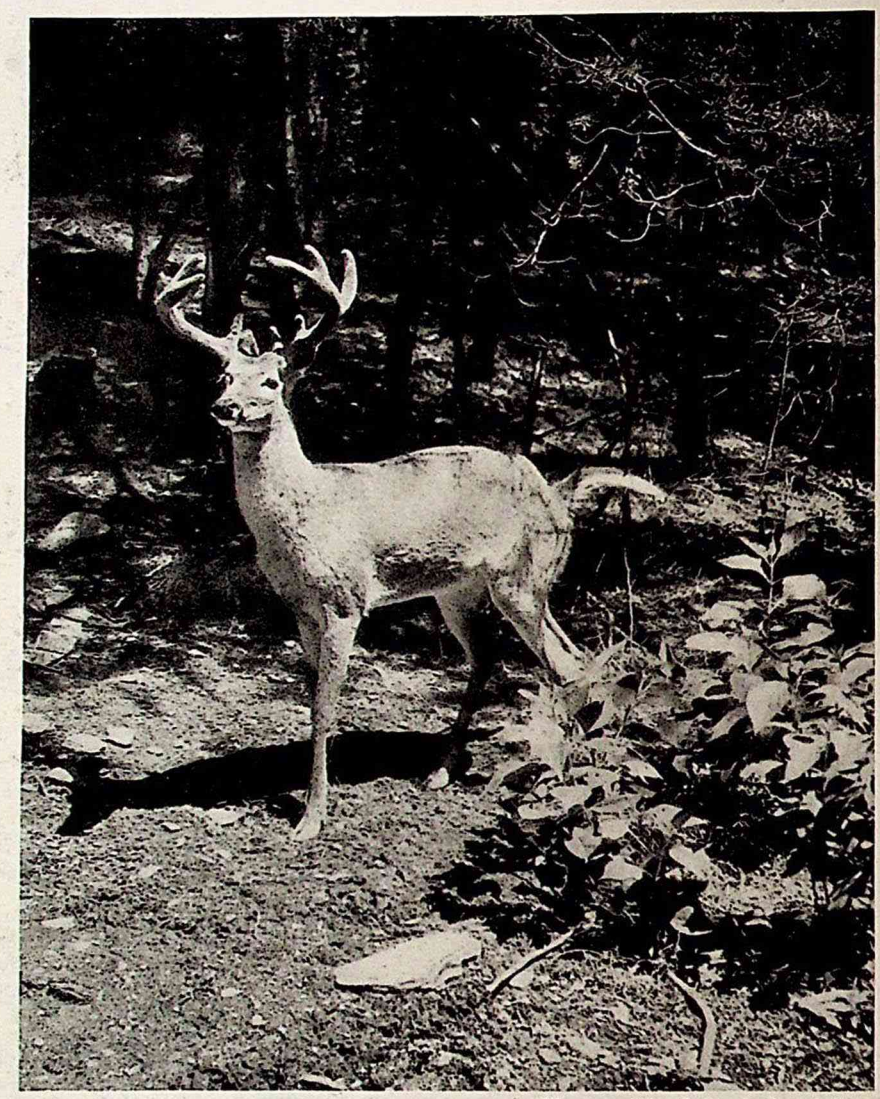
This bit of trail, thinly covered with snow, earned its name because of the difficulties experienced by hikers who tramped here before the modern path was built. It forms part of the Appalachian Trail, which winds along the main ridge of the Great Smokies for 71 miles.



Photograph by Edwin L. Wisherd

MOUNTAINS IN HAZE AND CLOUDS RISE OUT OF A TANGLED WILDERNESS

Although more than half the population of the United States lives within 600 miles, the Great Smokies contain areas few white men have ever visited. Streams teem with trout.



Photograph by Carlos C. Campbell

HEAD HIGH, TAIL EXTENDED, "PRANCER" POISES FOR FLIGHT

This white-tailed deer, a native of the Great Smokies, is on exhibition in a fenced-in wood near Gatlinburg, Tennessee, local headquarters of the National Park Service. Once deer were plentiful in the region, but hunters and lumbermen have driven the few that remain deep into the wilderness. To bring animal life back to normal, the Park Service plans to restock the area.

recently, when the National Park Service restocked them. We saw a motor truck on one of the mountain roads laden with thousands of tiny fish.

CASTING BREAD UPON TROUT WATERS

We visited fish-rearing ponds of native stone and cement where the little finny fellows are placed until they are old enough to fend for themselves in free streams. Both rainbow and brook trout abound.

A fish hatchery will be built by the Bureau of Fisheries on the Oconaluftee River.

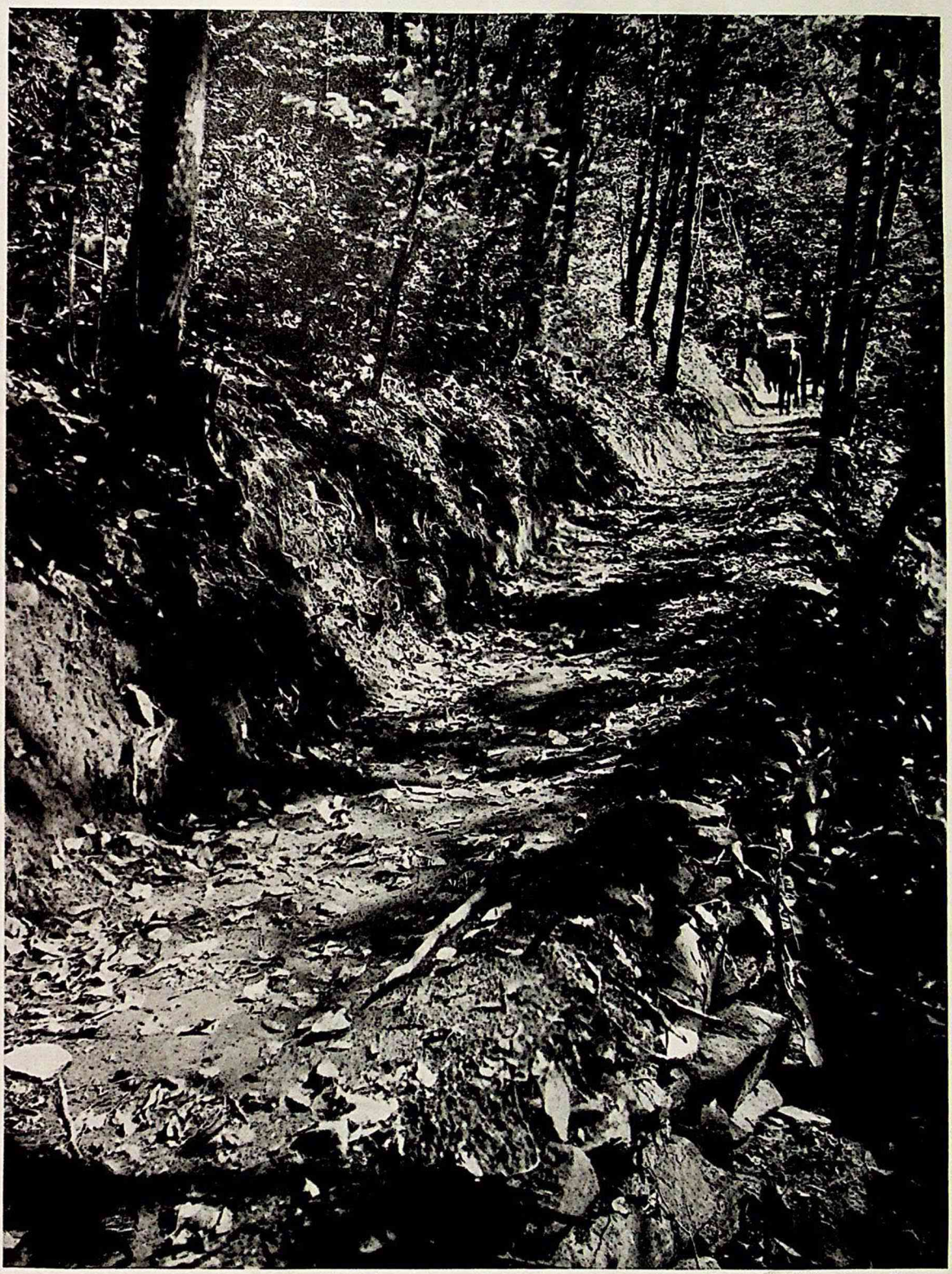
We often peered into the mountain streams but failed to see a trout. Having heard and, perhaps, told fish stories, I rather doubted tales of this region as a fisherman's paradise. So one of my companions purchased a loaf of bread, and led me to the rail of a rustic bridge over one of the streams. There was not a fish to be seen until he cast bits of the bread into the water. In a split second hundreds of rainbow trout appeared, lashing the water as they sought the crumbs.

Hunting is forbidden in national parks, but the protection given game in the Park area may cause an overflow into surrounding regions where nimrods are not barred.

Deer and other species of wild life that have been nearly exterminated or driven out of the Great Smokies soon will range the mountains under protection.

Hundreds of bears still are in the mountains, and their numbers are increasing rapidly. So far I have not sighted one, although I have seen their tracks.

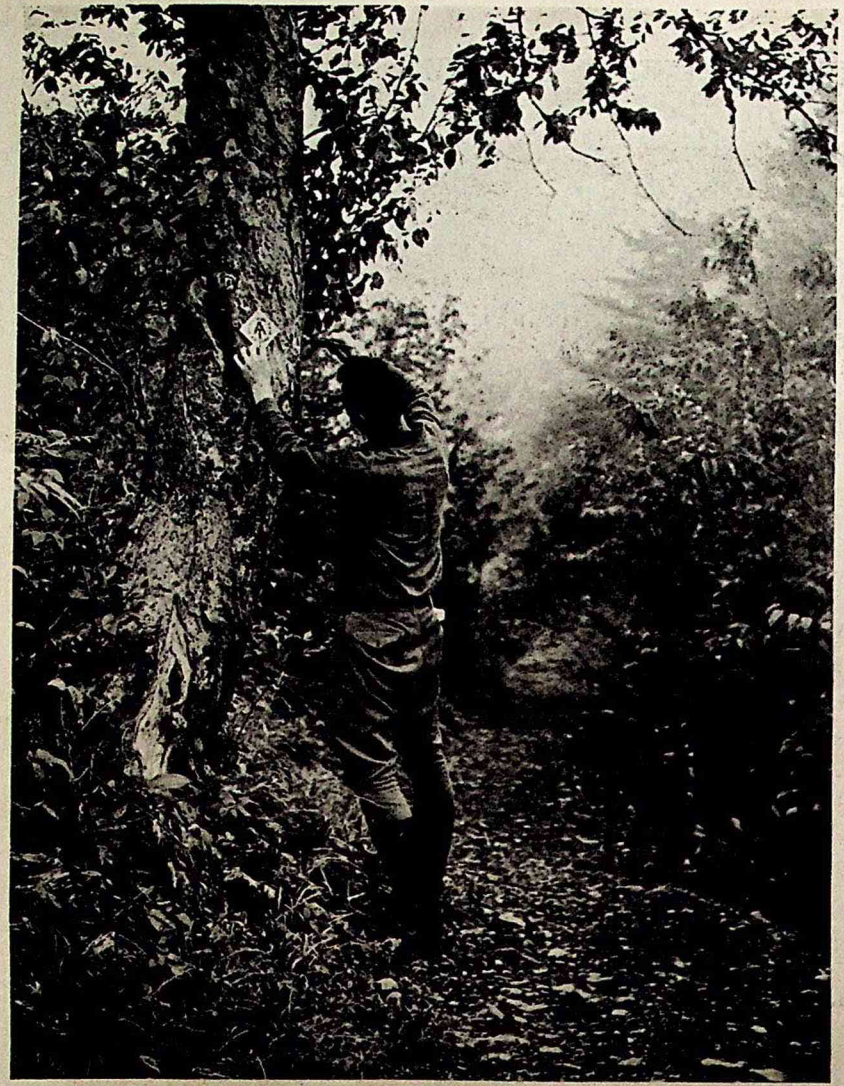
The eastern timber wolf and the eastern mountain lion were known to be in the mountains some 20 years ago, and the eastern otter inhabited one of the valleys until only a few years back. Virginia white-tailed deer, although not extinct, are rarely seen.



Photograph by Thompsons, Inc.

SHADY TRAILS AND EASY GRADES LURE THE HIKER AND HORSEBACK RIDER

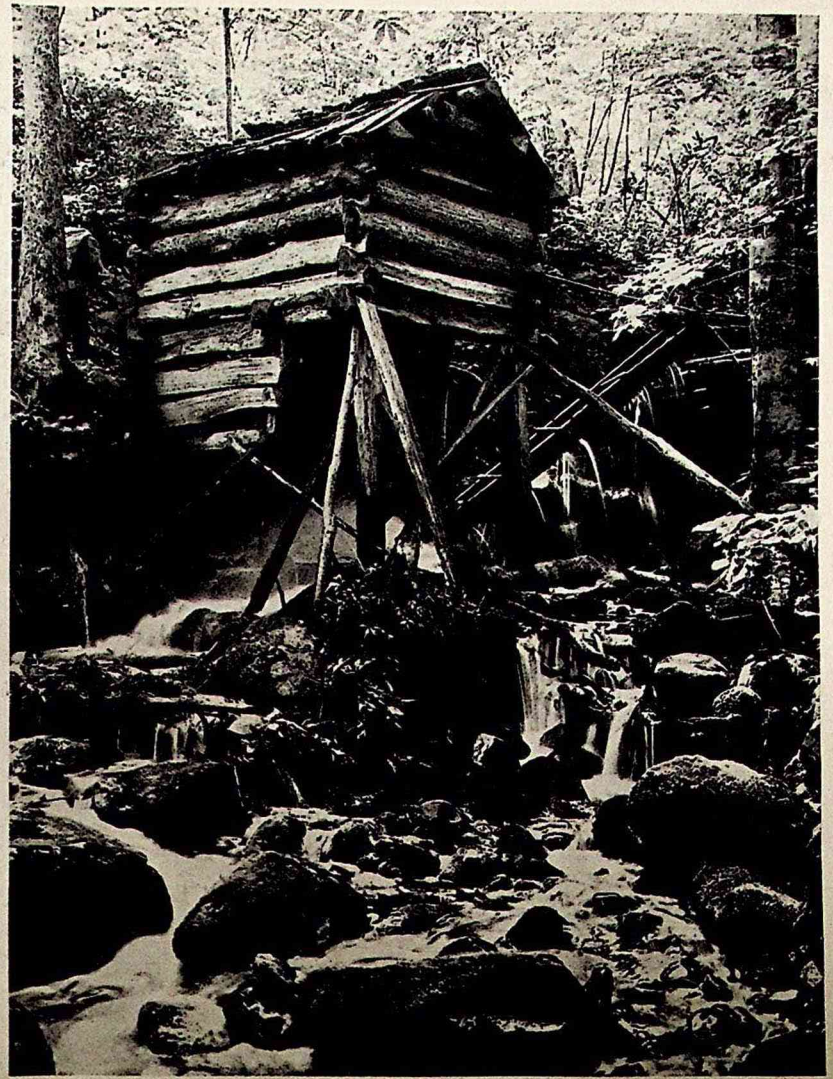
Hundreds of miles of fine trails have been built through this silvan region in which botanists have found some 1,500 kinds of plants, shrubs, and flowering trees. Engineers laid out the paths carefully so that they always lead to some spectacular waterfall or vista. This path is near Newfound Gap (page 245).



Photograph by Carlos C. Campbell

NEAR CHARLIES BUNION, A RANGER NAILS AN "A. T." MARKER

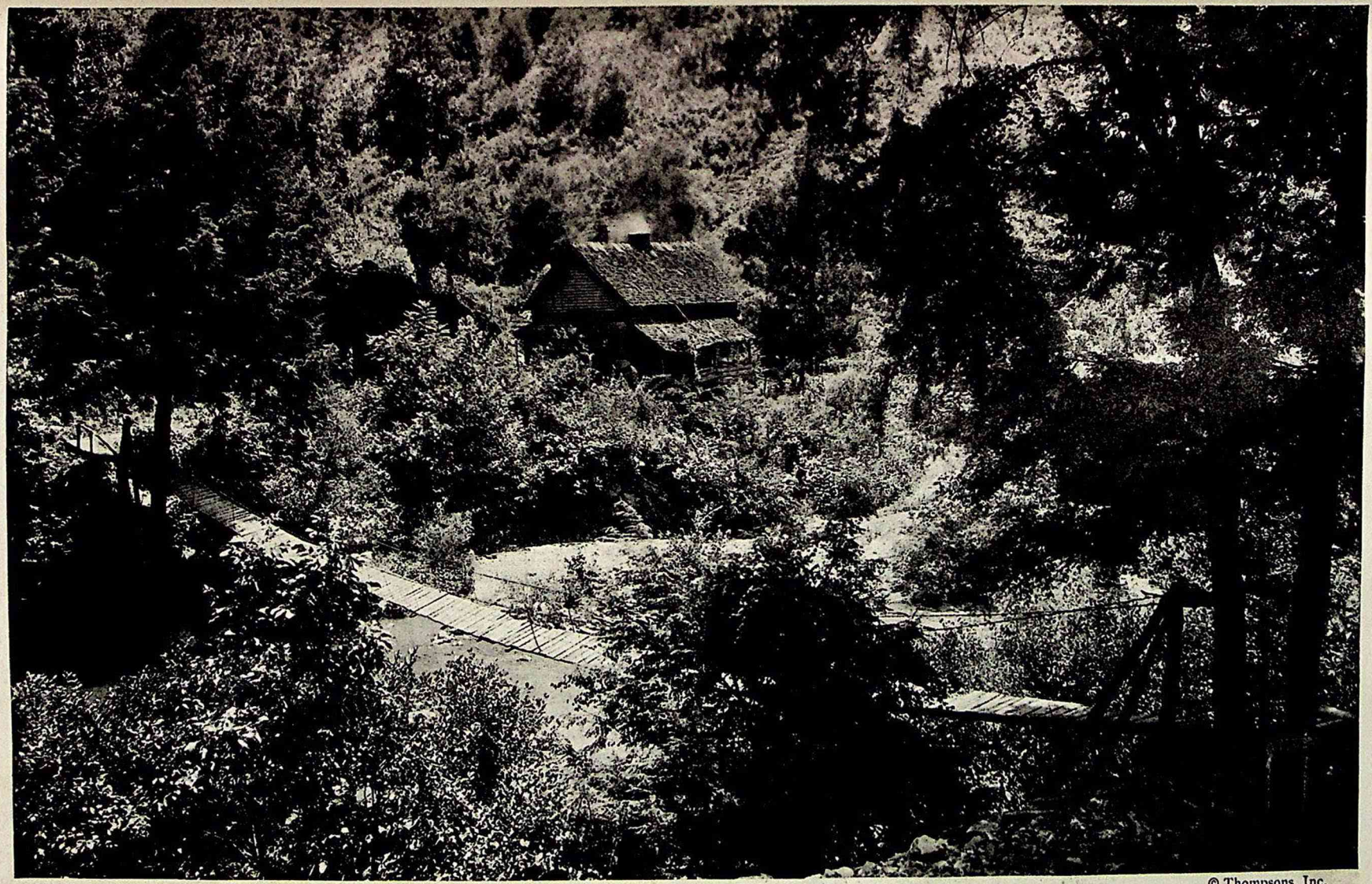
Peaks, gaps, and streams in the Great Smokies bear queer names (page 265). Charlies Bunion, a peak, commemorates a guide's sore toe! Fighting Creek Gap recalls an argument over a schoolhouse site. "Hells" are tangled growths, impenetrable without an ax. The sign marks the Appalachian Trail.



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A MOUNTAINEER "TOTES HIS TURN" TO A TUB MILL

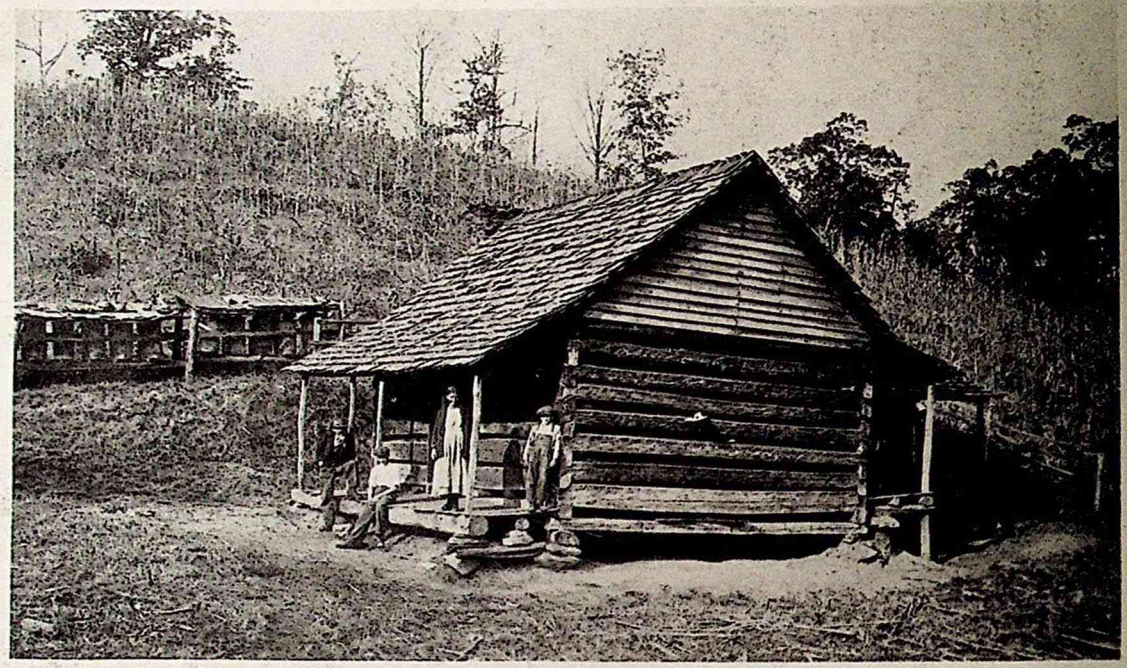
Near the door a man waits to grind his corn. A home-made vertical turbine turns the crude grinding stones. Fanlike blades and shaft are carved from a single block of wood. Capacity is small, about a bushel or tubful at a time; hence the name, "tub" mill.



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A QUIET VALLEY WITH SWINGING BRIDGE AND CABIN SET AMONG FLOWERING SHRUBS—A FREQUENT SCENE IN THE GREAT SMOKIES

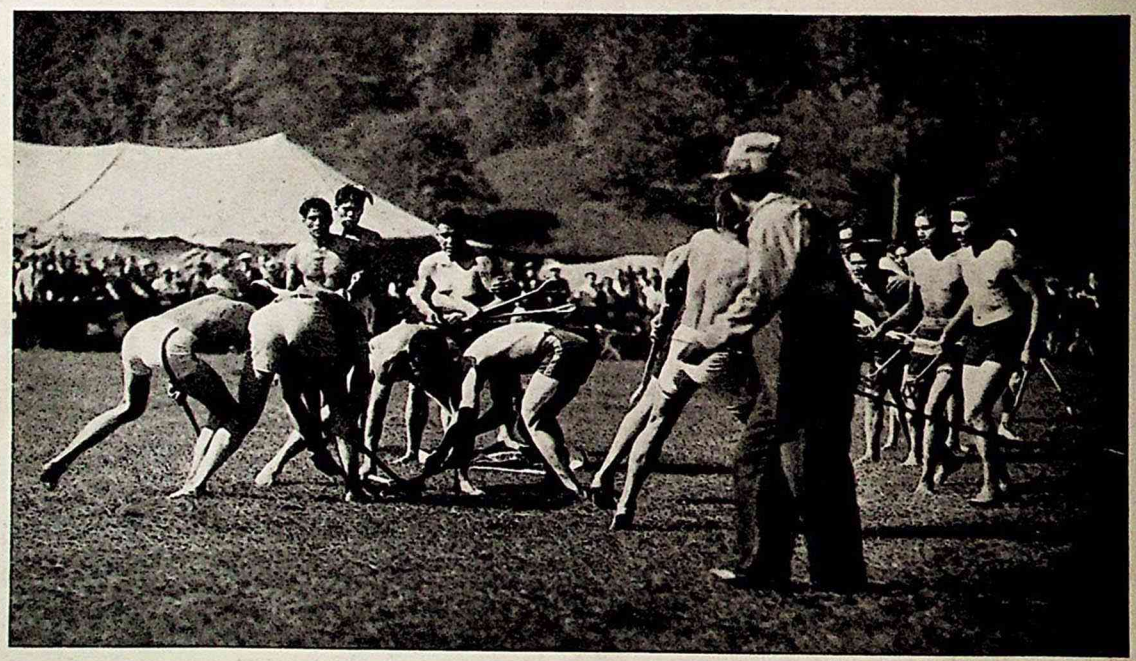
Log cabins usually have one room, combining the living and sleeping quarters, and an enclosed lean-to which serves as kitchen and dining room. Except for a few necessities such as pots and pans, nearly every article, from beds to bureaus, is home-made. Crude suspension bridges are the usual means for crossing streams, but the animals must use fords, or, in case the water is too deep, they are sometimes stabled on the far side.



Photograph courtesy U. S. National Park Service

AUNT SOPHIE'S WELCOME MAT WAS ALWAYS OUT

Thousands of returning visitors to the Great Smokies will miss Mrs. Sophie Campbell, who passed away last January. "Near 'bouts 75," Aunt Sophie, in homespun, enjoyed talking between puffs on her home-made clay pipe about her "gal (daughter) in Alabam'" and her "chap (son) in the gap over yonder." The cabin is of the clay-chinked log type. On the hillside beyond are "bee gums," or home-made beehives, hollowed out of tree trunks, and a corn patch, the source of the mountaineers' staff of life, cornbread.



Photograph by Thompsons, Inc.

IN GYM SUITS, CHEROKEES PLAY INDIAN BALL—A HARD, FAST GAME!

Young braves of the Qualla Indian Reservation play their own brand of ball, a combination of football, hockey, basketball, boxing, lacrosse, and tennis. First, the ball is tossed up between two opposing tribesmen, as in basketball. Then it is struck by sticks resembling small tennis rackets. Players may carry the ball in their hands or even in their mouths until the goal is reached. To retrieve the ball, opponents may use any means, even to striking the carrier with fists or sticks.



Photograph by Thompsons, Inc.

NEXT TO HIS FAMILY THE MOUNTAINEER'S GUN IS NEAREST TO HIS HEART

This old muzzle-loader has a hair trigger, and its pea-sized leaden bullets seldom miss their target when the lad's grandfather draws a bead. Since hunting is not allowed in the Park, men now sharpen their vision at "shoots." Made in the mountains with crude tools, many of these guns are valuable museum pieces (page 250).

Wild turkeys occur and ruffed grouse are plentiful.

Naturalists list 50 species of mammals in the Great Smokies, 27 species of reptiles, and 150 species of birds.

BIRDS RANGE FROM EAGLE TO WREN

Bird life here is unexcelled by that of any other inland forest area. On the trail to Thunderhead we saw a golden eagle and heard its shrill call as it soared high above the crest of the mountain. Many of the larger members of the hawk family nest in the Great Smokies. The raven is not uncommon and the red-breasted nuthatch, brown creeper, winter wren, black-capped chickadee, Carolina junco, and pileated woodpecker are often seen and heard in the forest. Bob-whites inhabit the coves and grassy balds.

The evening before we left the mountains we stopped at a roadside inn a few hundred yards from the Park boundary near Gatlinburg. A native of the mountains whom we had met a few days before, asked me where we had been in the hills. I described our wanderings.

"You ain't seen nuthin' yit," he said, and then entered into vivid descriptions of his pet areas in the mountains.

Another native of the hills heard my informant expounding the merits of this and that area and, in a louder tone, outlined the areas he thought I should see. A third entered into the discussion.

QUEER NAMES OF MOUNTAIN PLACES

Huggins Hell, Charlies Bunion, Mollies Butt, The Sawteeth, Fighting Creek Gap, Bull Head, The Jumpoff on Mount Kephart, False Gap, Camel Hump Knob, Old Black, Rocky Spur, Rough Creek, Miry Ridge, and scores of other oddly-named and isolated areas, as well as well-known spots

in the Great Smokies, were mentioned in a half hour of torrid argument.

I learned that some of the queer names in the Great Smokies originated from characteristics of the areas to which they applied; others from chance remarks of natives and visitors.

Bote Mountain was so named because a mountaineer, on entering a meeting called to decide which of two ridges a new mountain road should follow, broke a tie vote by exclaiming, "I bote for yonder ridge." The ridge he "boted" for is Bote Mountain; the one ignored thenceforth was Defeat Ridge.

Fighting Creek Gap got its name as a result of a quarrel over the location of a school.

Charlies Bunion commemorates a Great Smoky guide named Charlie, who, while conducting a party near the peak, compared it with his pedal affliction.

The persistent pull of the verdant beauty, the trout streams, the trails and highways, and the native highlanders have been important factors in the annually increasing guest list of the Great Smokies. Geography also plays its part in the mountains' popularity. Newfound Gap, near the center of the Park, is within 24 hours, by highway or railroad, of more than half the population of the United States.

"AND POINTS NORTH AND WEST!"

Last spring automobiles from every State in the Union, and Alaska, entered the Park area, carrying the bulk of more than 450,000 visitors. Louisville, Cincinnati, Atlanta, Birmingham, and Raleigh all lie within 300 miles' radius of the mountains.

An enthusiastic Park official reeled off the information that within 600 miles are St. Louis, Chicago, Milwaukee, Detroit, Cleveland, Pittsburgh, Philadelphia, Baltimore, Washington, Norfolk, Richmond, Memphis, Buffalo, and New Orleans. And we waited for him to conclude his list, like a train announcer, with the familiar "All aboard!"

The proposed Blue Ridge Parkway, linking the Shenandoah National Park and the Great Smoky Mountains National Park, will be a colorful corridor to the Great Smokies from the north, joining it with such scenic areas in North Carolina as Blowing Rock, Grandfather Mountain, Linville Falls and Gorge, Little Switzerland, Mount Mitchell, Great Craggy Mountains, and Big Pisgah Mountain.

Both Tennessee and North Carolina have provided modern highways, skirting the Park area.

The Nantahala River in North Carolina flows through a gorge famous for its spectacular vistas. Lake Santeetlah, with 83 miles of shore line, winds among the hills close to the southern boundary of the Park. Formed by the impounding of clear mountain waters by the 240-foot Santeetlah Dam, it has the attractiveness of a natural lake.

WHERE THE CHEROKEES ABIDE

Carved out of the North Carolina side of the Great Smoky Mountains, adjoining the Park, is the 63,000-acre Qualla Indian Reservation where nearly 3,200 members of the Eastern Band of the Cherokee Nation of Indians make their homes. Many of the tribesmen live in cabins on the slopes in much the same manner as the white mountaineers in the Park area (pages 250 and 264).

The native Indian costume is seldom seen in the Reservation. We saw two Indian women walking along a Reservation road. Their long, flowing skirts and gay kerchiefs resembled those of gypsies. One squaw had her papoose astride her back, Indian fashion.

In early October the Cherokees hold their harvest festival, when they display products of agriculture, arts and crafts, and perform ceremonial dances and native athletic feats before thousands of visitors, who travel long distances to witness the spectacle. The Indians still are expert with the bow and arrow and the blowgun.

At no season of the year is the Great Smoky Mountains National Park likely to be closed to visitors, said Major J. Ross Eakin, its superintendent.

"This will be an all-year-round park, because," he explained, "we do not anticipate any time during the year when we shall be unable to keep our roads free of snow."

In view of the growing hegira to Florida and other southern States for winter vacations, the Great Smoky Mountains National Park promises to have a visitors' register well filled every month of the year.

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INDIANA JOURNEY

BY FREDERICK SIMPICH

INDIANA is the sum of its parts. Yet how they differ! Streams of planes, trains, motorcars, trucks, and busses whizzing back and forth across its north and central parts; yet how little travel, by comparison, in the south.

In that industrial region on Lake Michigan which is not Indiana at all but a prolongation of Chicago, nothing but smoke, noise, and moving crowds.

In the south, a serene, unhurried people whose ancestors floated down the Ohio in flatboats, came from the Carolinas and Kentucky on horseback, bringing rifles, axes, spinning wheels.

Look down, in fancy, from a drifting blimp; imagine that here and there, painted on the ground in huge, white letters, are signboards on which you may read about the audacious men whose adventures made Indiana (map, pages 272-3).

Near South Bend, La Salle camped in 1679. At Vincennes, a century later, George Rogers Clark gained for us the whole Northwest Territory.

That tall shaft at Pigeon Roost Memorial shows where, in 1812, Indians slew a whole white settlement.

East of Evansville, at Lincoln City, is the monument to Lincoln's mother, Nancy Hanks, and the boyhood home where her son Abe split rails.

Along the Wabash—the *Ouabache* of old—are strewn the sites of French fur-trade posts, built in the early 1700's. North of LaFayette, the Tippecanoe Battlefield, where Harrison defeated Tecumseh's brother; and, just out of Kokomo, a monument to Elwood Haynes, who in 1894 launched one of America's first "horseless carriages," on the now historic "Pumpkinvine Pike."

In fact and fancy you may see still other markers, showing the homes of such famous Hoosiers as James Whitcomb Riley, Benjamin Harrison, John Hay, Lew Wallace, Joaquin Miller, Booth Tarkington, Albert J. Beveridge, George Ade, Theodore Dreiser, Charles Major, John T. McCutcheon, Meredith Nicholson, and Wilbur Wright; and, up among the scenic lakes of northeast Indiana, in the "Limberlost" region, that rustic, tree-shaded log-house home of Gene Stratton Porter.

It sounds fantastic, the idea of floating over a State and reading its life story on giant signboards. Yet, in a vicarious way, you can do it, for there exists a pictorial map, drawn by Lee Carter and published by the State Conservation Department, which shows in graphic detail much that has happened here since Father Marquette saw northern Indiana in the 1600's. This map was our guide over some 6,500 miles of Hoosier highways and byways.

START AT TERRE HAUTE AND SEE INDIANA

"On the Banks of the Wabash" is the State song. It ought to be; down the Wabash came the French, first whites, to settle in Indiana; this stream formed part of their long route from Quebec to Louisiana.

Starting from Terre Haute, we halted where a street crowd watched a tricky machine turn dough into doughnuts, instantaneously. "Think of that, making cake in a minute, by electricity," said an old man. "I used to split wood every morning

before the old lady could get breakfast. Often country folks didn't even have matches; if we let the fire go out, we had to ride over to the neighbors' and borrow some live coals."

Girls picking long, green, warty cucumbers out of the air in a 35-acre steam-heated glass house stopped us next. Inside that place it smelled and felt just like Manila in the rainy season, hot and sticky. A bug's paradise! Swarms of bees are kept, purposely, to pollinate the cucumber blossoms. Not on the ground, but high up overhead like grapes on a trellis hung the cucumbers. Perspiring blondes and brunettes reached up with long-handled tools and clipped them off (page 274).

Elks' Country Club House, facing the Wabash, stands where Zachary Taylor whipped the Indians in 1812. Parallel with the river is the abandoned Wabash and Erie Canal, its grass-grown towpath still visible.

An Englishman—about 1848—wrote of a canal trip from here to Ohio. It was hot, he said. All day passengers sat on top the boat, many under umbrellas. Some fiddled or sang; others read, or watched the scenery go whizzing by as towpath horses pulled the boat at four miles an hour! This Englishman was disturbed that Americans should eat squirrels!

Through pioneer Terre Haute came the old National Road. Over it swarmed the cheering legions—soldiers, settlers, prairie schooners, freighters, live stock, boys and dogs—off to conquer the West. Today this early wagon trail, long but a line of ruts dodging stumps and mudholes, is U. S. No. 40. At Terre Haute it intersects U. S. 41 to form one of America's busiest crossroads.

U. S. POPULATION CENTER HOVERS NEAR TERRE HAUTE

South of the city hovers the population center of the United States (map, pages 272-3). For the past 45 years it has been slowly wandering across Indiana.

Trotting horses, harnessed to light sulkies, set world records at Terre Haute. Nancy Hanks, Maud S., Dan Patch, Mascot, Hal Pointer, and Axtell raced here on the historic "four cornered" track in the days of Bud Doble, greatest reinsman of his age. Now a stadium, with night ball games by electric light, rises where crowds used to cheer goggled drivers holding tight reins to keep their sweating trotters from "breaking" into a gallop.

Spirits, gunpowder, glass, this town makes them all. You see piles of sand, soda, and limestone fed to big furnaces; then gobs of red-hot glass dropping into a magic machine that shapes the bottles—one every two seconds.

Some men were piling tall bottles into a boxcar.

"Where for?" I asked.

"Down to Key West, across on the car ferry to Habana, then east by rail to where Cubans make Bacardi rum."

Oddly self-contained, this region. Local straw makes packing cases; printers make labels, farmers grow vegetables, and canners do the rest.

Out at Rose Polytechnic Institute boys were building a toy bridge. Some day, when they're full-fledged engineers, they may build big ones in Bolivia or the Philippines!

Saint Mary-of-the-Woods is one of America's exclusive schools for girls. I saw a group riding, clad in smartest saddle-club togs, the horses groomed slick and shiny, their hoofs oiled. Perhaps some of these girls have descended from women who also rode horses—from Virginia or the Carolinas, over the wilderness trail, carrying babies, dreading panthers and Indians (Color Plate VII).

Glimpses of the Wabash as we rode south to Vincennes made us think of the French *voyageurs*, and the wild, half-naked *coureurs de bois*.

The voyageur had a license to trade. But the "bush loper" was an outlaw in that long war for fur between French and English. Like the honest traders, the renegade offered knives, beads, axes, guns, and blankets for the red man's pelts, but cheated when he could, and corrupted the Indians with cheap whiskey, which sold as low as 14 cents a gallon.

Traders and boats of all kinds used to swarm on the Wabash. John Parsons, a young Virginian who came here in 1840 to buy land, wrote: "In the fall, 1,000 flatboats will pass down the river, the majority loaded with flour, pork . . . lard, cattle, horses, oats, cornmeal, and corn on the ear. . . . They told me of a flatboat . . . carrying a load of hickory nuts, walnuts and venison hams."

In 1935 I saw only skiffs, canoes, small houseboats, and pleasure launches. But



Photograph by Willard R. Culver

"SKINNY" TAKES A DARE AT GOSHEN'S OLD SWIMMING HOLE IN THE ELKHART RIVER

"Oh! the old swimmin'-hole! In the happy days of yore,
When I ust to lean above it on the old sickamore,
Oh! it showed me a face in its warm sunny tide
That gazed back at me so gay and glorified,
It made me love myself, as I leaped to caress
My shadder smilin' up at me with sich tenderness. . . ."

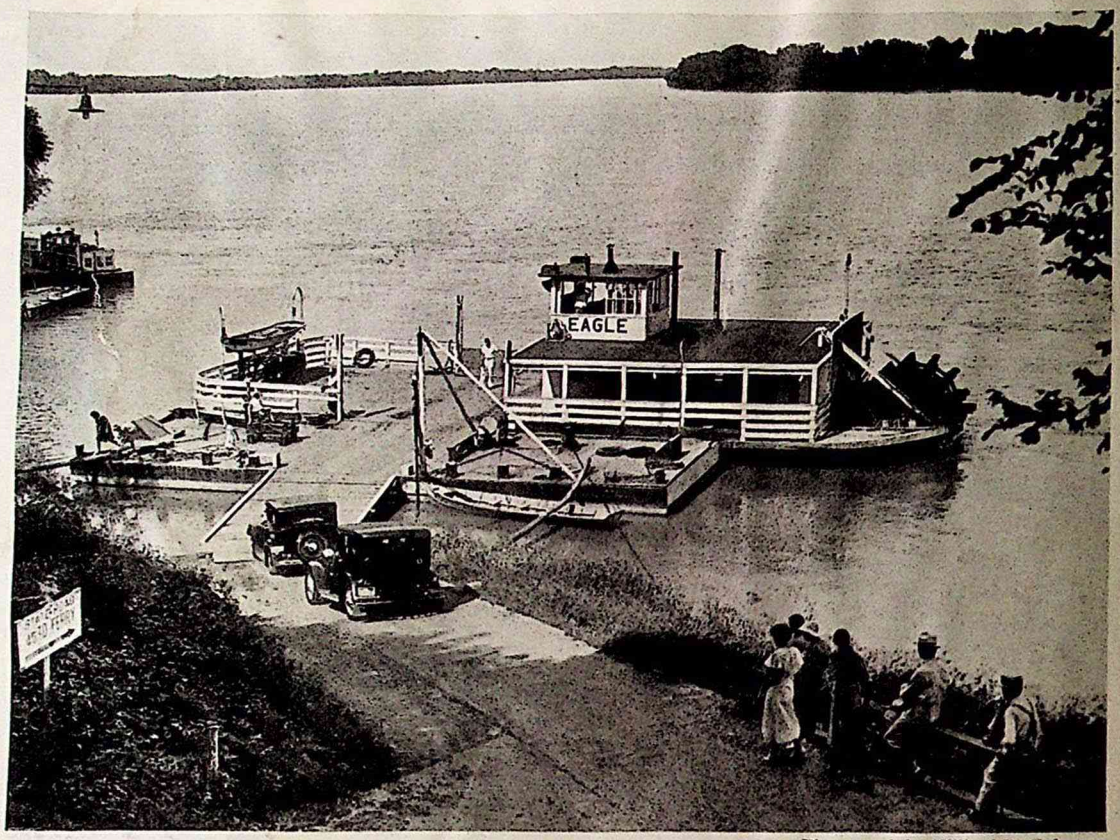
—James Whitcomb Riley, a native son of Indiana (Color Plate IV).

you can't ride along the Wabash, with all its traditions, historic sites, old graveyards and monuments, without thinking of its part in making America.

On a Wabash tributary near Peru is the grave of Frances Slocum, stolen by the Indians as a girl in 1778. She spent her whole life with them, refusing, when finally visited by her own white relatives, to leave the tribe. Pioneer John Parrett of Whitley County advertised that he had paid Indians $2.50 to release a six-year-old white boy, and that he would keep the boy "till his parents, if living, and chance to see this notice, may find him."

Burned at the stake, tomahawked, scalped, what a tragic host of white men, women, and children were slain by Indians —or held captive, often for life—in the settlements of Kentucky, Indiana, and beyond!

Before our American Revolution the French had a trading post at what is now Ft. Wayne, one at Fort Ouiatenon, near



Photograph by Willard R. Culver

FROM THIS LANDING ON THE OHIO, YOUNG ABE LINCOLN EMBARKED FOR NEW ORLEANS ON A FLATBOAT

Spencer County's first settlement was made here at Rockport ferry in 1802 by Waller Taylor, who served later as a major on the staff of Gen. William Henry Harrison at the battle of Tippecanoe. In early days the place was known as Hanging Rock, its Indian name. Lincoln's home, to which his father brought him from Kentucky at the age of seven, stood about 17 miles north of Rockport. A replica of the log store where Lincoln clerked is one of the buildings in the "Lincoln Pioneer Village" (page 302).

LaFayette, and at Vincennes a well-formed settlement, with more than 250 Frenchmen, wives, and children.

Fighting Indians and English to the north; fiddling, singing, scouring the forests for pelts; building a wooden chapel which was Indiana's first church, the French dominated this era, often called the most romantic in Hoosier history.

GLAMOUR OF OLD VINCENNES

Rain poured from black skies the Sunday we reached Vincennes. Floods swept under the Lincoln Memorial Bridge, which spans the Wabash where Lincoln's family crossed in migrating to Illinois (page 279).

Mass was being said in the Cathedral of St. Francis Xavier—standing now where the French held their first Mass more than 200 years ago. Its library, next door, was locked; but from a friendly priest I borrowed the big key.

"Go in, my son," he said, "and stay as long as you like."

I could have stayed a week!

Here is an astonishing collection of books and manuscripts. It was assembled by Bishop Brute, declared by President John Quincy Adams to have been "the most learned man of his day in America."

The oldest volume here was printed 16 years before Columbus discovered America! Here, too, is a map of Lake Superior, drawn by two Jesuits about 1670.

Vincennes enjoys deathless fame for its role in the conquest of the vast Northwest; its eventful history fills books. First the French, then the British, held it.

During the American Revolution, Governor Patrick Henry of Virginia sent Col.



Photograph courtesy Gen. Robert H. Tyndall

THE MASSIVE HOOSIER CAPITOL IN INDIANAPOLIS IS BUILT OF ROCK FROM INDIANA'S LIMESTONE HILLS

Begun in 1878 on the site of a previous capitol structure, it enjoys the distinction of having cost less than the sum appropriated for it. When territorial government was established, July 4, 1800, Vincennes was the seat (p. 278). In 1813 the capital was removed to Corydon, in the southern part of the State; when it was finally moved to the new wilderness town of Indianapolis, a horse-drawn wagon lumbered along forest trails, hauling the few documents up from Corydon.

George Rogers Clark to make war in this wilderness.

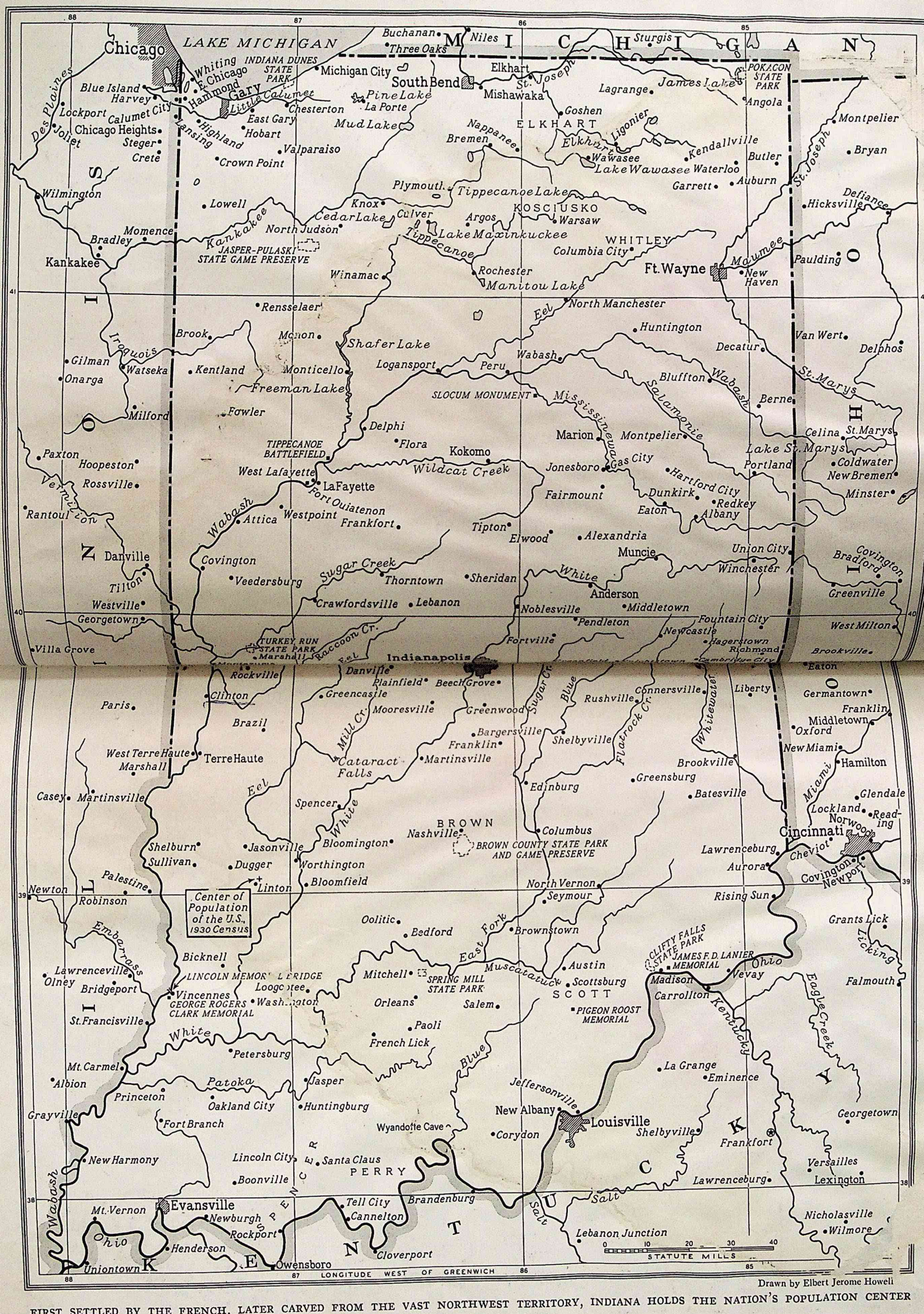
How Clark first took Kaskaskia and then marched through mud and floods to engage the British at Vincennes forms a classic in the annals of military exploits. That Clark tomahawked some of his Indian enemies and threw them into the Wabash shows the ruthless customs of that time and place.

By Clark's daring our new Nation gained land from which were carved the States of Ohio, Indiana, Illinois, Michigan, Wisconsin, and much of Minnesota. This "Indiana Territory" had its capital at Vincennes. William Henry Harrison was the first governor. Think what a "territory" this became, when in 1803 President Jefferson made the Louisiana Purchase and added that to it! Tiny Vincennes ruled most of America from the Alleghenies to the Rockies—and from the Gulf of Mexico up to the Great Lakes (Plate II and page 278).

Lincoln used to read the Vincennes *Western Sun*. When he passed through here, moving with the family to Macon County, Illinois, he went to the humble home of the *Sun* to study a printing press in operation. It was the first he had ever seen. Reid's painting, "The First Meeting of Two Great Emancipators," shows a tall, ungainly youth standing beside the crude hand press.

Despite the bustle of modern Vincennes, with its mills and factories, you cannot view its historic shrines or browse among the pioneer bishop's books without feeling that its early French spirit survives.

From New Albany, on the Ohio, up through Vincennes, ran Indiana's first stagecoach line—an extension of the Wilderness Road in Kentucky. In one family of



Drawn by Elbert Jerome Howell

FIRST SETTLED BY THE FRENCH, LATER CARVED FROM THE VAST NORTHWEST TERRITORY, INDIANA HOLDS THE NATION'S POPULATION CENTER



Photograph by Willard R. Culver

PICKING CUCUMBERS OUT OF THE AIR IN STEAM-HEATED, GLASS-ROOFED GARDENS

Imagine a 35-acre farm, completely roofed over with glass! Then miles and miles of cucumber vines, growing high overhead, the long green vegetables hanging down like flocks of flying bologna. In this moist, tropical air bees are kept to pollinate the bloom, while perspiring girls reach up with tonglike tools and pick basketfuls of cucumbers. Wintry gales may howl, or summer droughts blast open-air fields, but here in the Davis Gardens near Terre Haute crops mature the year around, and five or six carloads a day may be shipped to cities all over America.

Kentucky folk who settled and built their hut on this "Buffalo Trace," panthers one season killed first the father, then the son, and wounded the family horse.

We drove east along its old course to French Lick. Loaf around its mineral springs with the guests, and you can soon fit them into groups. The first is healthy, exuberant, obviously out for a good time; the second, more quiet and reserved, wants only to be let alone, for rest. The third is sick, or thinks it is, and would like to talk about it. This last goes in for daring gulps of queer-smelling water; for tales of gastronomic disaster, and peculiar pains; for claims of improved conditions along the alimentary canal after yet more of the local water! (Color Plate II and page 301.)

French Lick makes you think of Wiesbaden, and the rheumatic Romans who haunted its baths and were rubbed down with the cocoa butter and witch-hazel of those days. One spring here is named for Pluto, another for his wife, Proserpine.

Private cars parked on switches; private airplanes; shiny, silent-running motorcars and haughty chauffeurs; high-spirited saddle horses; a hotel lobby vast as a polo field, crowded with white ties and bare shoulders at the dinner hour; clubrooms where chips clink and little balls dance in turning wheels, presided over by well-groomed watchful men who seem to know all the guests by name—such are aspects of French Lick; they identify it.

Northeast from French Lick, in a peaceful valley between wooded hills, you come suddenly on the pioneer village of Spring

Mill, restored by the State. With a low rumble that shakes the whole mill, a big wheel gives power to grind corn and saw lumber.

An apothecary's shop, set with the same old bottles, books, scales, and furniture used a century ago; the old tavern, with crane and kettles; the general store—all are here. In the mill are shown primitive, home-made things, from bear traps and ox yokes to wooden dishes and crude farm implements. One hour here is a graphic lesson in pioneer Hoosier culture.

North we rode, into a scarified and mournful land—between Bedford and Bloomington—from whence comes nearly all our cut building stone (page 297).

Fly over, and you look down upon a wounded world of deep, rectangular holes, from which oölitic limestone is cut. Over the tumbled land are scattered blocks and broken stones, as if archeologists had dug up buried cities, or ancient workers had cut rocks for pyramids and Chinese walls.

In scores of structures in the United States, from the Empire State Building in New York to the Capitol of North Dakota, this stone has been used. It also has been employed in construction of many fraternity houses in Bloomington and in the newer State University buildings there.

"I will study and get ready and then maybe the chance will come." You see these words of Lincoln inscribed on the wall of the bookshop in Union House, on the campus.

Bloomington shows much vitality. It makes trainloads of bedroom furniture. Four home-town boys rounded up a lot of



Photograph by Willard R. Culver

GEORGE ADE, BELOVED HOOSIER AUTHOR AND PLAYWRIGHT, WITH HIS BOSTON TERRIER, "SPRY"

About 35 years ago, Ade's first "Fables in Slang" gained such popularity as to influence the speech of college students all over America. Editors everywhere were swamped with offerings from young writers trying to imitate his style. In the long list of Ade's books and plays, none are better known than "The Sultan of Sulu," "The County Chairman," "The College Widow," and "Father and the Boys." Here he is at work in his home at Hazelden Farm, near Brook, Indiana.



Photograph by Frank M. Hohenberger

THIS BOY'S NOSE IS ON THE GRINDSTONE, BUT HIS MIND MAY BE ON FISH, BASEBALL, OR BULLFROGS

Industry, character, self-reliance—farm life develops them all. Likewise, a kinship with nature which city boys may gain only at costly summer camps. No country boy needs camp talks on how to build fires or traps, handle a horse, track a rabbit, or identify a bird or tree!

stray dogs and trained them to do tricks; they added a few other animals and finally took the open road as "Gentry Brothers' Dog and Pony Show"—to delight children for a generation.

Twenty miles east are the "Sleepy Hollows" of Brown County; from some 100-year-old log houses here you can see the smoke of Bloomington. Yet some old people here have never been to Bloomington!

IN BROWN COUNTY PIONEER HOOSIER CULTURE STILL PERSISTS

Kin Hubbard, Hoosier journalist-philosopher writing as "Abe Martin," made Brown County backwoods people known all over America. His crude sketches of such characters as Miss Tawney Apple, Ez Pash, and Fawn Lippincut, and his short, humorous epigrams of their imaginary remarks added to our fund of wit and wisdom.

Now a State park and game preserve is set amid these hills, with a lodge and cottages named in honor of Abe Martin and his renowned characters. One section is reserved for hunters—who may use only bows and arrows!

About the old village of Nashville an artists' colony is gathered, and a gallery there exhibits their paintings of the wild hill country and its fast vanishing ancients.

One lifelong resident is 83, and the whole county calls her Granny. "Weeds are taking my garden," she said. "I've hoed all forenoon. I'm glad you came. It gives me a chance to rest while we talk.

"Wild animals when I was a girl? Plenty! Mr. Hutchison, our neighbor, shot a panther right up the creek. They wouldn't let me see it, for fear there might be another one. . . . Once the dogs chased a bear past the house. . . . Yes, foxes still get my turkeys—and my young pigs, too. Our sheepherd dog pays no attention to them—no more than if they were other dogs. It takes a hound to run foxes."

". . . Did I ever see a horse-collar woven out of corn shucks? I helped my father make many a one. I molded bullets, too, and carded and spun wool, and I used to make all our candles. . . . But what are you asking about these old things for? It's so long ago!"

Her heroic type is almost gone. Picnic parties come in swarms; painters and snapshot fiends hound the horseshoe pitchers and other oldtimers; radio talk and tunes blare from cars parked up valleys where once only panthers growled, wild turkeys gobbled, and pioneer cowbells tinkled lonesomely.

On the way up to Indianapolis, with Mr. Culver, who illustrated this article, we saw a man and some boys setting out tomato plants (page 298).

"What do you want with our picture?" asked the youngest, who rode on the planting machine.

"For THE GEOGRAPHIC!"

"That's fine. Can you get an article about Indiana as good as that 'Washington, the Evergreen State?' . . . Send me the magazine with my picture in it!"

Farther along the same road was another boy, cultivating his mother's garden with a white goat hitched to a small push-plow.

"Sure, we broke the billy goat, my brother and me. Our father is a barber in Indianapolis, but we moved out here in the country, where we could all help. A man gave us this goat, and we make him help, too." (Page 292.)

INDIANAPOLIS—THE CAPITAL

From atop a high building you see glittering Indianapolis spread over the prairie. Nebuchadnezzar, who viewed Babylon from his flat-roofed palace, would enjoy the picture here, with all its temples, shrines, monuments, and tree-lined avenues. Here are restful parks and floral displays, quite as satisfying, I am sure, as were the hanging gardens by the Euphrates; and here is a war memorial as impressive as any temple raised by Babylonians (page 296).

No one great city dominates this State; Chicago pulls at it on the north, Cincinnati and Louisville on the south. Yet Indianapolis, its capital and nearly its geographic center, is the seat of Hoosier power.

In 1820 a small spot was cleared of forest here, and the capital later moved from Corydon, in the south. One wagon, two weeks on the wilderness trails, hauled all the young State's papers, furniture, books, and money. From the streams men seined fish in such quantities that wagonloads were fed to hogs.

Settlers increased; the National Road came through from the East, driving west toward the Missouri. West-bound "movers" multiplied. Some days saw hundreds pass in covered wagons, freighters, stagecoaches, often with women or girls driving



SPEED DEMONS OIL UP FOR LA FAYETTE'S SOAPBOX DERBY!

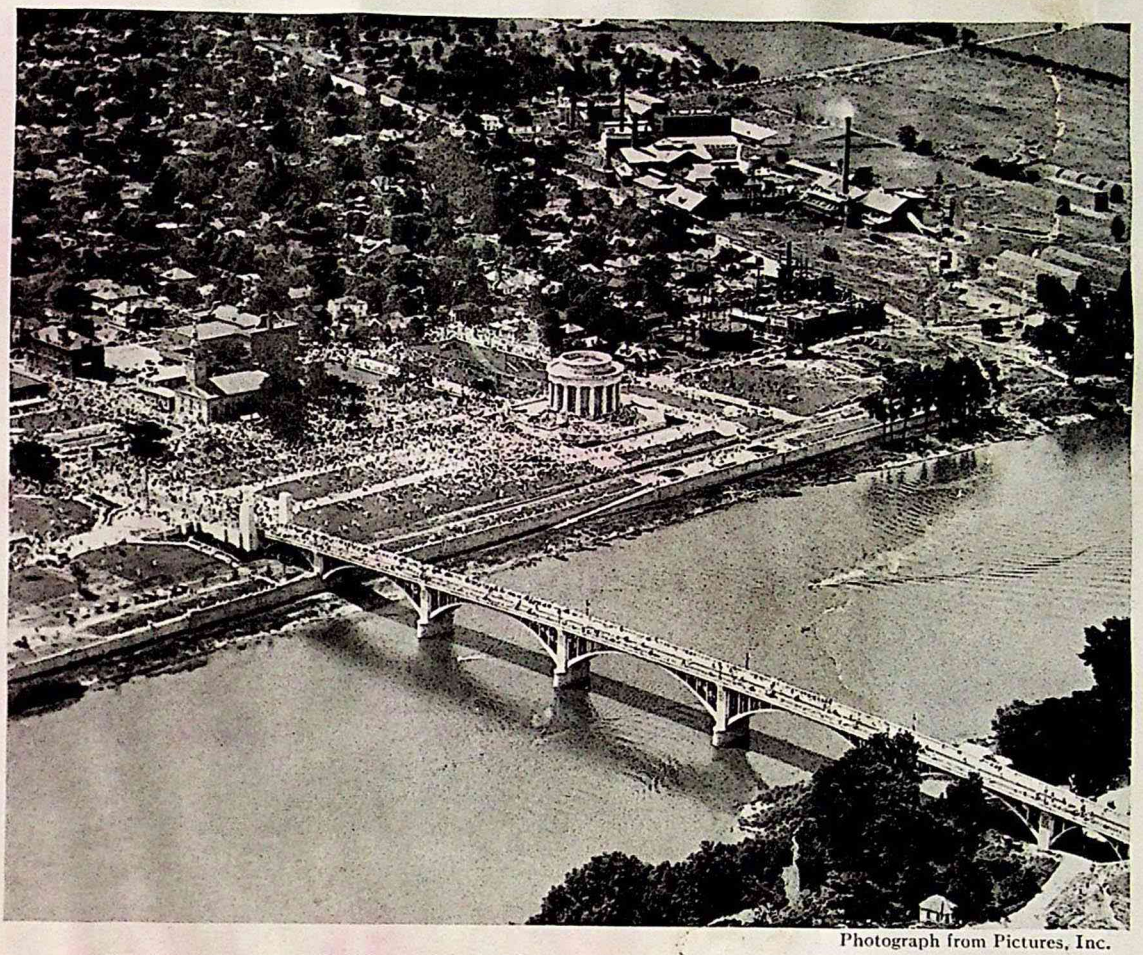
This is a downhill coasting race among home-made toy cars—all commercially built vehicles are barred. Winners in a hundred or more local Indiana races compete in the annual national at Akron, Ohio.



Photographs by Willard R. Culver

ONCE THIS SMALL HOUSE AT VINCENNES WAS THE TERRITORIAL CAPITOL OF PRACTICALLY ALL THE MISSISSIPPI BASIN

When, in 1803, the Louisiana Purchase was added to the "Indiana," or Northwest Territory, the whole vast new domain from Ohio to the Rocky Mountains and from Canada to Louisiana was governed from this two-roomed house! William Henry Harrison was territorial governor. His old home, Grouseland, called "The White House of the West," also stands at Vincennes.



Photograph from Pictures, Inc.

A MEMORIAL TO GEORGE ROGERS CLARK NOW RISES WHERE FORT SACKVILLE STOOD WHEN BRITAIN RULED ALONG THE WABASH

The white circular monument, with columns, honors the American soldier who was sent by Governor Patrick Henry of Virginia, during the Revolution, to make war in this wilderness. His capture of Kaskaskia, his march through Indiana, mud, and flood to victory at Fort Sackville—as Vincennes was then called—form a classic in the annals of military exploits (Plate II). This air view was made on June 14, 1936, when the President delivered an address. Because Lincoln's family, migrating to Illinois, crossed the river here, the bridge is named for him.

the teams while men and boys herded other animals after the wagons.

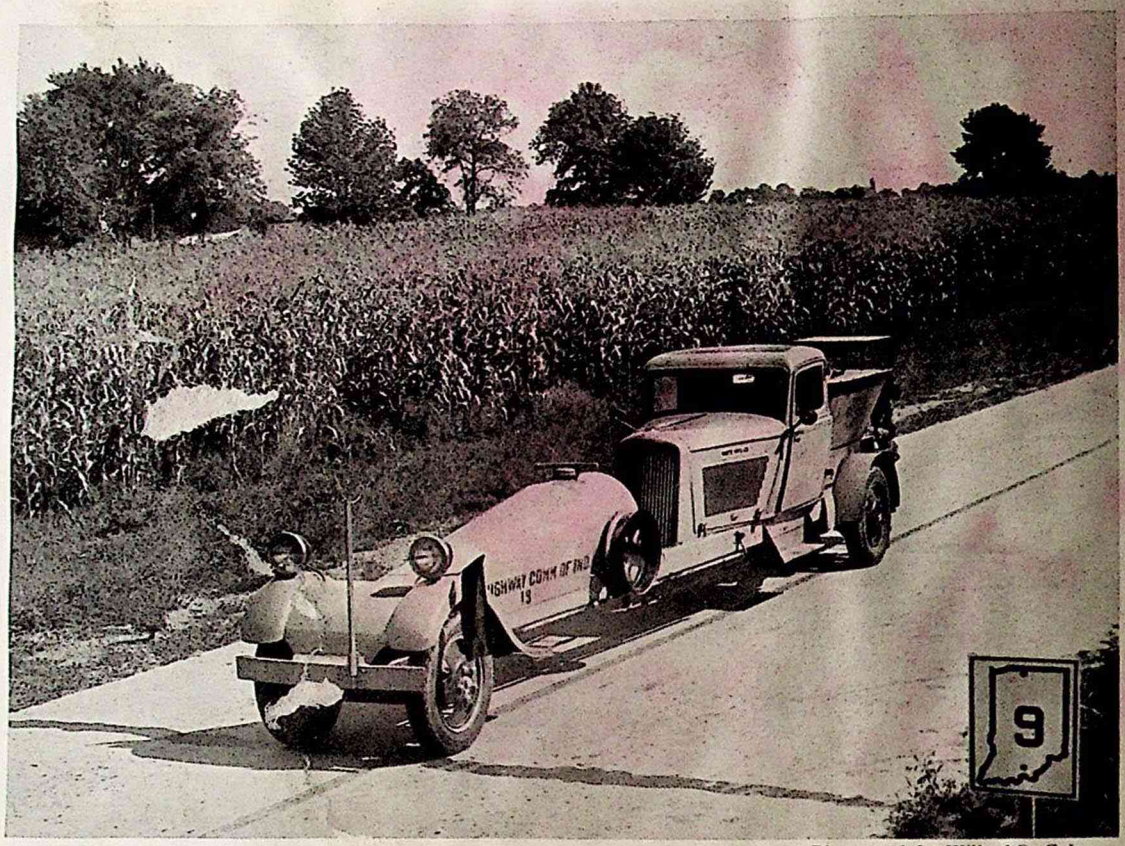
Today Indianapolis stands, a typical, well-balanced Midwestern city, intersected by four national highways used by three-fourths of all transcontinental motorists (Color Plates III-V and pages 294, 296).

High above the city rises America's largest neon aviation beacon, usually visible from 75 miles away.

About the city runs the first belt-line railway built in America, and the seven-acre Union Station with elevated tracks accommodates 40 trains at once. Every 24 hours, 82 mails—by air, rail, and truck—reach the city; and it averages a convention a day—five days out of every week the year round. One auditorium seats 10,000. What a change since Henry Ward Beecher preached here in his small church, and edited his farm paper!

Get up early, any morning, and you see some 500 trucks coming into town from all directions, hauling hogs, cattle, calves, and sheep to the largest stockyards east of Chicago. Among world grain markets the one here ranks sixth, and as a cash mart it leads in the United States.

Some 840 factories make many things, from insulin and inner tubes, automobiles and canned food, to birdcages and popcorn machines. One shop can make 5,500 bicycle tires every day. Another makes chains—chains that went with Admiral



Photograph by Willard R. Culver

A PAINTBRUSH ON WHEELS MARKS THE CENTER LINE OF INDIANA HIGHWAYS

To keep a straight course, the driver steers by the upright "sight" attached to the front bumper. Operated by two men, the machine paints a 4-inch ribbon on 20 miles of road a day. Six such machines have marked about 6,600 miles of road.

Byrd to the Antarctic; chains for the first Wright plane; for the dirigibles *Maco...* and *Shenandoah;* for battleship hoists and elevators; chains for 40 foreign countries.

Doorbell ringers all over the Nation sell silk hosiery made here (Plate XII), while another product is advertised by a singing barber who fills the air with saponaceous rhapsody.

Armored cars for the Shah of Iran; trucks to haul pipes that carry oil from Mosul to the Mediterranean; hams and bacon for the world's breakfast—they originate here.

"Yours is a tough task," said an Indianapolis editor, "trying to write the story of Indiana in *one* article! . . . Go and see Laurance Chambers, head man at Bobbs-Merrill. . . . He wrote the best tabloid history of our State. It's illustrated with reproductions of Benton's murals. You probably saw them in the Indiana exhibit at the Century of Progress; they picture Indiana from pioneer times."

If wastebaskets gave up their dead, what a place the Bobbs-Merrill publishing house would be to trace Indiana's literary career! It has bought and published many a manuscript which brought fame to a hitherto unknown writer. Not only Hoosiers, but writers from all over the Union have been launched by Bobbs-Merrill. Long ago it started Mary Roberts Rinehart, whose first work, "The Circular Staircase," other houses had ignored. Lately it published "Oil for the Lamps of China," which brought fame to Alice Tisdale Hobart.

Look over its lists, old and new, and you are astonished at the millions of books issued from this midwestern plant. Charles Major's "When Knighthood Was In Flower" sold more copies than did "Uncle Tom's Cabin." This firm, putting on what James Whitcomb Riley called "its literary overalls," published every book the famous Hoosier poet ever wrote, and all without ever a written contract! It introduced Harold MacGrath to the world



Photograph by Willard R. Culver

WITH KEEN EYE, THIS GIRL RAPIDLY INSPECTS NEWLY MADE GLASS JARS FOR POSSIBLE FAULTS

From Ball Brothers' colossal plant at Muncie flows an almost incredible volume of glassware. Fruit jars made here are used in homes from Maine to California, and in many foreign lands. Natural gas started Muncie on its distinguished industrial career (page 319).

with "The Puppet Crown," and Meredith Nicholson with "The Main Chance" and "The House of a Thousand Candles."

Other titles are remindful of days gone by. Here Brand Whitlock brought "The Thirteenth District"; Emerson Hough his "Mississippi Bubble"; Anna Katharine Green, "The Filigree Ball"; George Randolph Chester, "Young Wallingford"; Zona Gale, "Romance Island"; George Ade, "The Slim Princess" (page 275); Earl Derr Biggers, "Seven Keys to Baldpate"; Ring Lardner, "Gullible's Travels"; and Irving Bacheller, "The Light in the Clearing."

Because of its early conspicuous success with fiction, fiction especially is associated in many minds with the Bobbs-Merrill Company. But its contribution in other lines, aside from its law and educational publications, shows scores of titles on subjects from "Backward Children" to "The Chinese"—too many to list here.

Carved on the stone front of the great Lilly Laboratories at Indianapolis are the chemical symbols used by ancient alchemists—who took them from the Chaldean—who thought the earth's metals were related to the planets! Hence such old planetary names for drugs as lunar caustic and saturnine poison.

DOCTORS ALL OVER THE WORLD USE MANY DRUGS AND SERUMS MADE HERE

Yet look into this Lilly plant and see what incredible strides chemists have made since the dim, distant age of alchemy, quackery, and philosophers' stones!

In this temple of scientific research and in the giant production plant attached to it, where machines roll 500,000 pills a day and grind tons of strange things, from dandelions to bovine stomachs and livers, you meet a thinking brigade of chemists, pharmacists, bacteriologists, and medical investigators representing the best scientific brains of many lands, from England to China.

How to turn new ideas, theories, and discoveries about medicine into practical use is the business of this vast industry. It worked with the Toronto Insulin Committee and with the Harvard Pernicious Anemia Committee to put their drugs quickly into doctors' hands (page 292).

Here is not only pure research in many things, from toad poisons to Chinese herbs, but such mass-production problems as packing millions of doses of ground liver in capsules instead of vials.

In plain English, here in Indiana is an astonishing example of how highly organized, efficient business takes up where science leaves off.

Jenner learned long ago how to vaccinate against smallpox, but it takes huge capital and infinite skill to make enough vaccine and supply it fresh to the whole world, when and where needed.

You can think of many such examples, from common disinfectants to diphtheria antitoxin.

PRICELESS BOONS OF SCIENCE ARE MADE AVAILABLE TO MILLIONS

But for such mass production of drugs, chemicals, and medicines, we could not check or control infectious disease and epidemics, despite the great discoveries of Koch, Pasteur, Lister, Sir Ronald Ross, Schaudinn, Von Wassermann, and Ehrlich.

Nor could mankind benefit from the findings of a Hopkins, a Mendel, or an Osborne as to vitamins, nutrition, and the prevention of nutritional disease, nor dare to hope in face of tetanus, diabetes, and anemia.

Look at all the live animals on which tests are made; look at all the strange weeds, plants, roots, that come to this busy place—and look at the endless barrels, boxes, jars, and bottles of mysterious mixtures that issue from it, and are shipped to drugstores, hospitals, armies, navies, and to doctors all over the world, and you walk out with this thought:

What good is any discovery in medicine—no matter how great its potential value—unless some industry exists like this one, able to *make* the new serum, vaccine, drug or tissue product in big lots, and then send it to places where people need it?

Not far from these scientists, I talked with country folk who insisted that marriage on Saturday brought bad luck. "My mother bit my nails off, when I was a baby, instead of cutting them, so I wouldn't grow up a thief," one woman said. That luck is affected by black cats, brooms, ladders, dishcloths, and crowing hens, or that dogs' tails may draw lightning in thunder storms are myths of Hoosier folklore, as in that of many other older States. But when I mentioned them to youngsters, they laughed.

It was spring. That wholesome, satisfying smell of soft coal smoke mixed with earthy odors of plowed fields came to us as we neared Richmond. Close behind the plowmen marched sedate, glistening blackbirds, picking up worms, clucking in contentment. Colts played among the dandelions; peacocks "called for rain"; lambs scampered; big red sows and their grunting broods wallowed in mudholes fringed with "smartweed," ragweed, Jimson, and dogfennel; excited cackles rose from every busy barnyard. Wild fowl make no such uproar. Why then should our hens, domesticated for centuries, show such hysteria over one more egg?

Acres of roses, grown under glass, appear just west of Richmond. Straight through town runs the historic National Road, its century-old traffic stream paced by street cars.

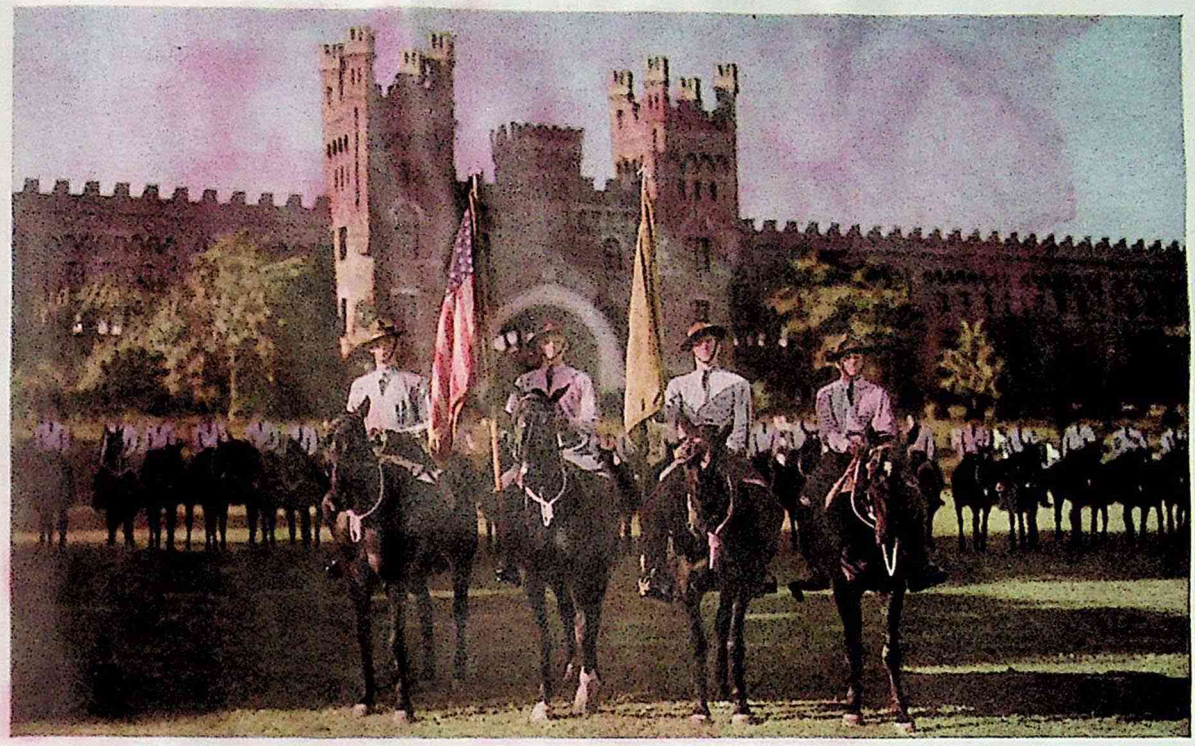
For decades pianos made here were exported to many far nooks and crannies of the world; now it is iceboxes, and other things. Here in 1807 Quakers built their first Indiana meeting house; here now is Earlham College, which the Friends set "beside the Great Road," a token of the service for which the college was to stand.

At Fountain City, near Richmond, is the Levi Coffin Home, "Union Depot of the Underground Railway" in slave times; it handled thousands of fugitives.

South, down the historic Whitewater Valley where many Carolinians settled after 1804, is Brookville. It lives, serene and contented, with its romantic past.

Hereabouts was born Maurice Thompson, who wrote "Alice of Old Vincennes"; also Ida Husted Harper, early crusader for woman's rights, and Mary Louisa Chitwood, a gifted Hoosier poet. Booth Tarkington's grandfather was a Brookville preacher; in its heyday, the region had 17 distilleries, many grist, flour, and saw mills. Small as it was, this town produced an almost incredible number of men who were later to become governors and senators, or to gain national fame in other fields.

Well-known painters like J. Otis Adams, William Forsythe, Otto Stark, T. C. Steele, and others worked here, catching the scenic



CULVER'S COLOR GUARD LINES UP BEFORE THE SUMMER SCHOOL CAVALRY

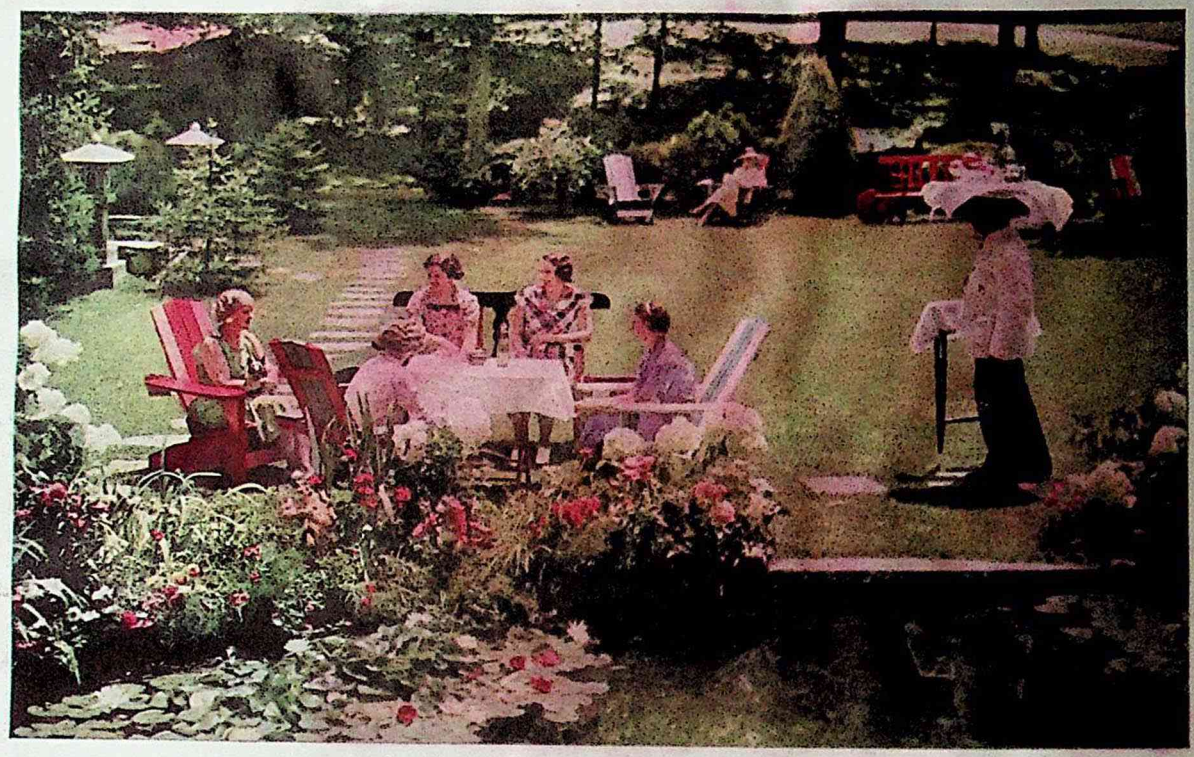
In the spacious riding hall beyond, these young men strive for the troop monogram, the reward for excellence in care of horses and riding. They must qualify in "monkey drill"—that is, ride two horses at once, pyramid, do stunts bareback, and leap on running horses. Culver Military Academy is highly rated by the War Department, and cavalry officers are detailed as instructors.



© National Geographic Society Finlay Photographs by Willard R. Culver

PURDUE BOYS BEAT THE BIG DRUM, WHILE THE DRUM MAJOR STRUTS BEFORE COEDS

The University's band, of 125 pieces, pioneered in the practice, now common in many colleges, of spelling out names by shifting formations.



WAITERS BALANCE TRAYS ON THEIR HEADS AT GAY FRENCH LICK RESORT, WHOSE MEDICINAL WATER IS GOOD FOR THOSE WHO CAN TAKE IT

About floral gardens runs a hedge, cleverly trimmed in the forms of animals. Each year, after the Kentucky Derby, French Lick is the rendezvous of many horse owners and turf devotees.



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Finlay Photographs by Willard R. Culver

"SURRENDER OF FORT SACKVILLE TO GEORGE ROGERS CLARK," BY FREDERICK C. YOHN

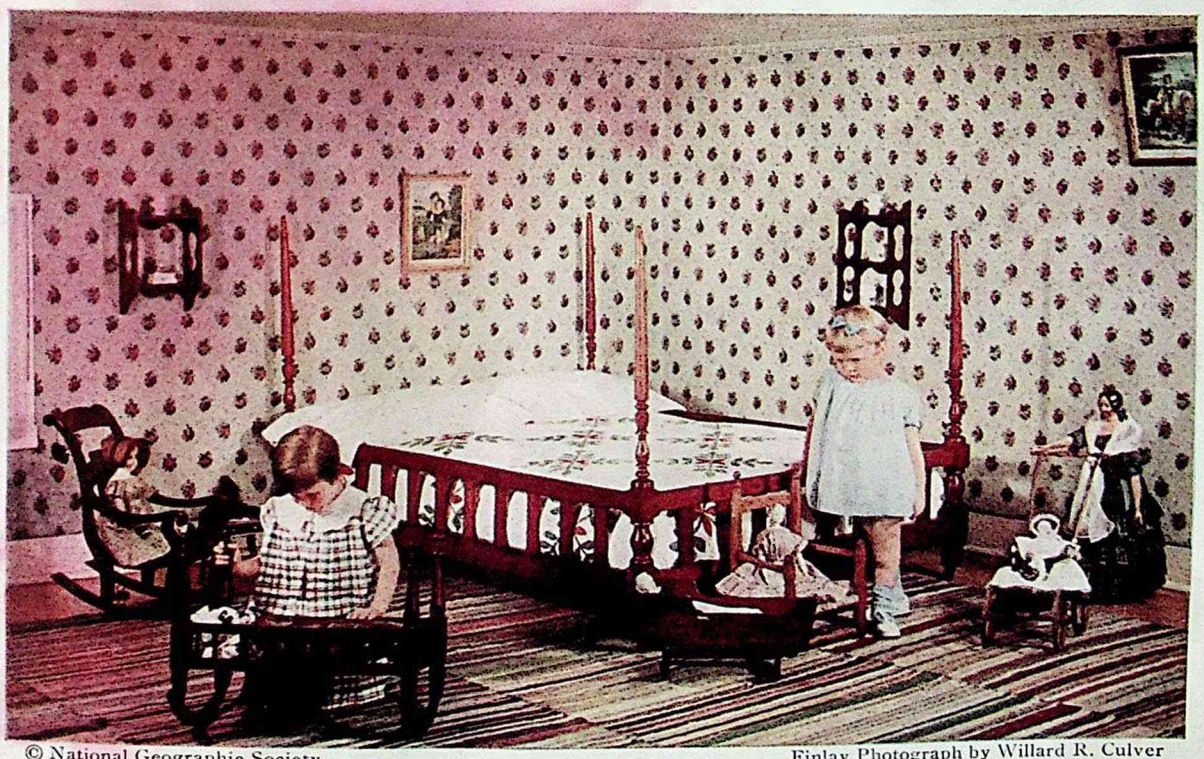
Few events in American military annals equal Clark's exploit on February 25, 1779, depicted in this painting that hangs in the State library at Indianapolis. The capture of the Wabash post helped bring the vast Northwest Territory under the Stars and Stripes.



Autochrome Lumière by Willard R. Culver

HOOSIER INVENTIVE GENIUS WAS CONSPICUOUS IN THE EARLY DAYS OF THE AUTOMOTIVE INDUSTRY

At Kokomo, Elwood Haynes built and drove one of the first "horseless carriages." The Studebaker, Auburn, and Dusenberg are still made in the State. An Indianapolis home.

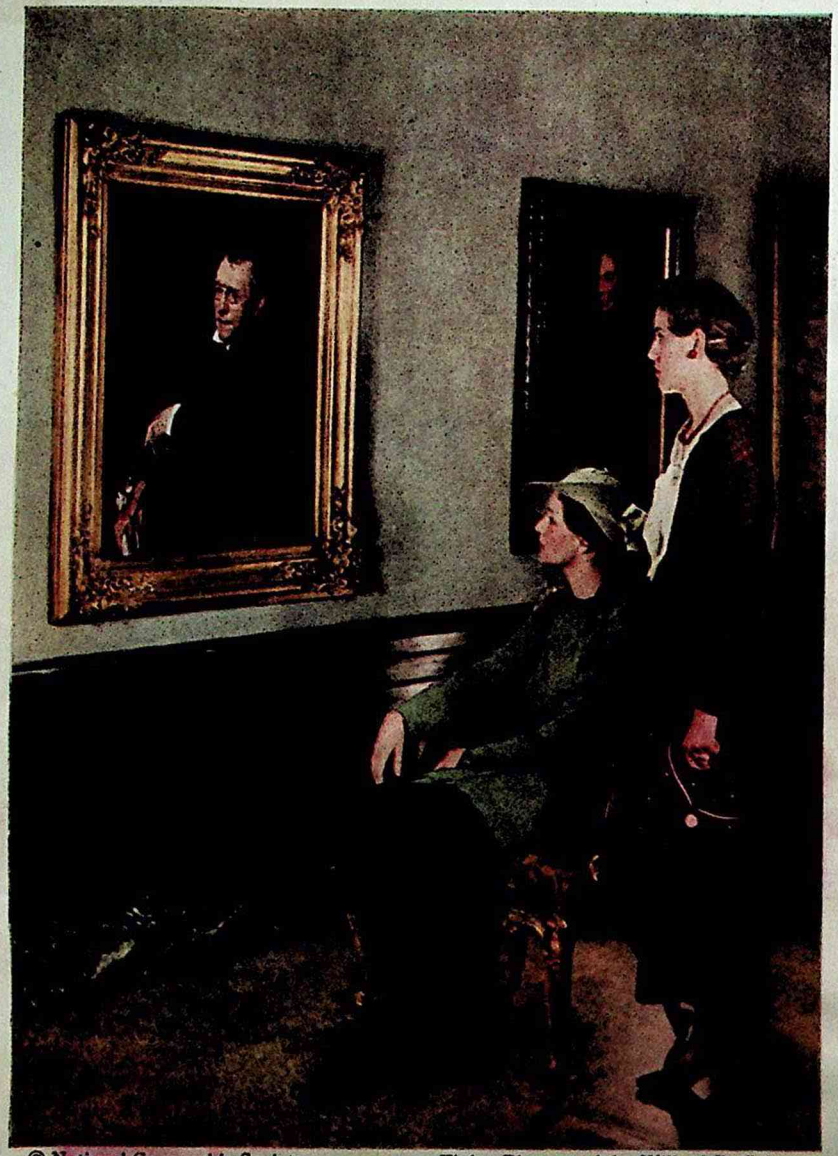


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Finlay Photograph by Willard R. Culver

LITTLE WOMEN, GRAVE WITH DOMESTIC CARES, PLAY AT HOUSEKEEPING

This colonial nursery is preserved intact, being a room on the third floor of historic Lanier Home, now a State museum, at Madison on the Ohio River. Some of the dolls, cradles, and trundle beds are from 80 to 100 years old.



© National Geographic Society Finlay Photograph by Willard R. Culver

JAMES WHITCOMB RILEY, HOOSIER POET, SMILES AT THOSE WHO ADMIRE HIM AND HIS HOMELY POEMS IN JOHN HERRON ART INSTITUTE, INDIANAPOLIS



Autochrome Lumière by Willard R. Culver

ONCE, TWICE, THRICE, FOUR TIMES, PETER LUX OF SHELBYVILLE HAS WON FIRST PRIZE FOR THE FINEST CORN GROWN IN AMERICA



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FOUR GOLDEN EAGLES LOOK DOWN ON THE CENOTAPH IN INDIANA'S WORLD WAR MEMORIAL PLAZA

A bronze plaque on the black cenotaph bears an inscription to the memory of James Bethel Gresham, of Evansville, Indiana, a corporal in the 16th Infantry, who was the first soldier in the American Expeditionary Forces to be killed in action in the World War. Facing the Plaza in the heart of Indianapolis rises the graceful tower of the Scottish Rite Cathedral. At the right is the American Legion's National Headquarters Building.



JUST SUCH A ROLY-POLY LAMB MAY HAVE FOLLOWED MARY TO SCHOOL, TO MAKE "THE CHILDREN LAUGH AND PLAY"

Flocks of fine sheep are frequent in central and northern Indiana. These tame lambs were photographed on the stock farm of Squire Jess Andrew, near Westpoint.



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Finlay Photographs by Willard R. Culver

IN A CHILDREN'S PET PARADE MARCHED TWO MAKE-BELIEVE ZULUS AND A "TIGER"

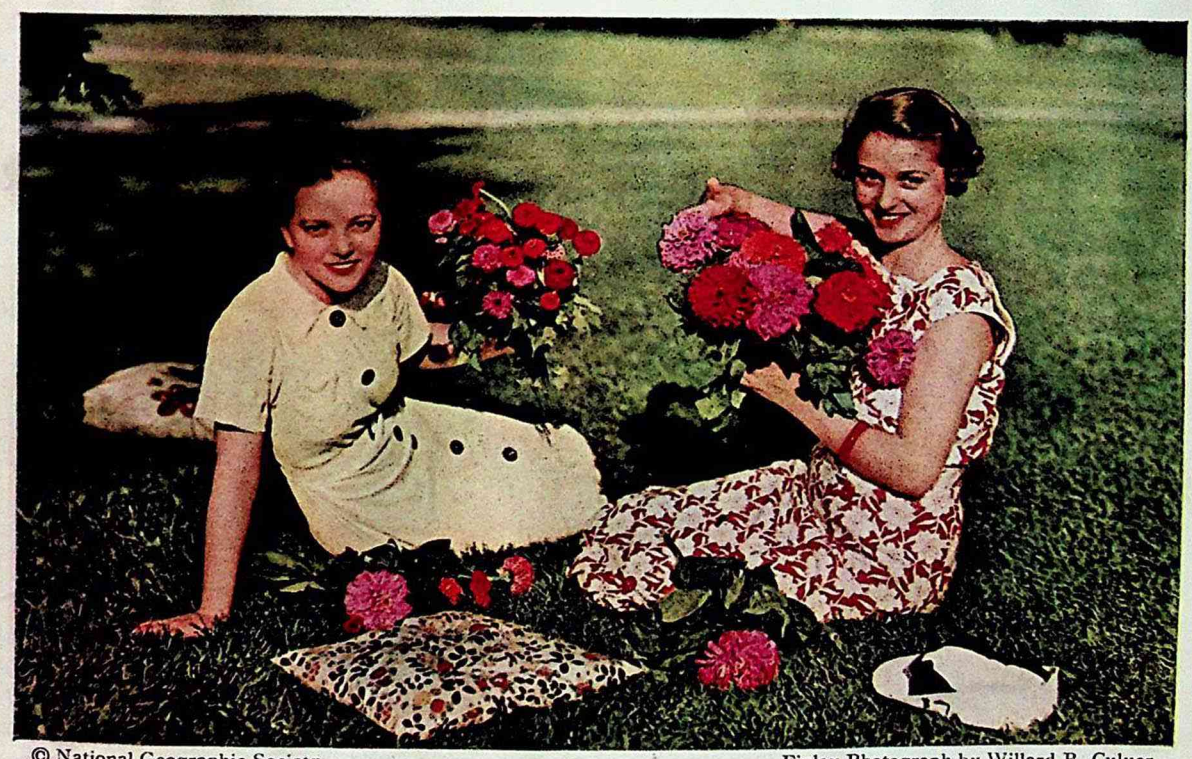
Entered from Mishawaka Orphans' Home, this brother and sister took first prize. Such annual processions, popular in Hoosier towns, bring out a veritable Noah's Ark of assorted creatures, from goats, birds, and lambs to snakes and turtles.



Autochrome Lumière by Willard R. Culver

DEADLY BOW-AND-ARROW SAVAGES SLEW MANY A WHITE IN THESE SAME WABASH WOODS WHERE SCHOOLGIRL ARCHERS NOW COUNT THEIR BULL'S-EYES

These four tempting targets for yet another gallant little bow-and-arrow marksman are students at Saint Mary-of-the-Woods. This noted Catholic college is half hidden in forests near Terre Haute.

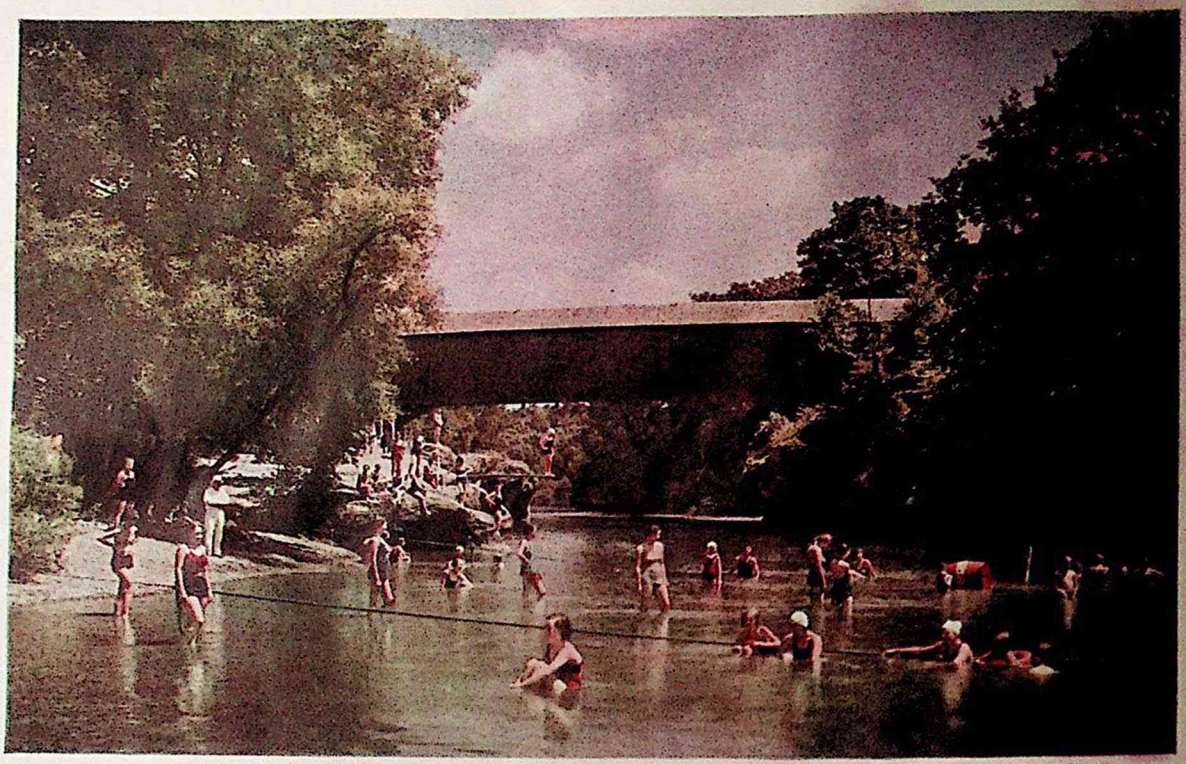


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Finlay Photograph by Willard R. Culver

WITH THE CLEAR, CANDID EYES OF YOUTH, PURDUE COEDS SMILE ON THE LUCKY LENS

In 1931 Indiana chose the Zinnia as its official State flower. Here are some of the many varieties grown at West Lafayette by Purdue University, notable for its farm experimental work as well as its signal achievements in the field of engineering instruction (Color Plate I).



Agfacolor Plate by Willard R. Culver

SANDY BOTTOMS AND SHADY BANKS MAKE COOL, CLEAR SUGAR CREEK A RESTFUL RESORT ON HOT SUMMER DAYS

How that old covered bridge used to echo to Dobbin's iron-shod hoofs! Many such bridges still survive in Indiana. This structure stands near Marshall, in the Turkey Run State Park.



© National Geographic Society

Finlay Photograph by Willard R. Culver

LOOK AT THESE CYCLING NYMPHS IN SHORTS AND REFLECT THAT NOT SO LONG AGO EYEBROWS WERE RAISED AT BLOOMERS!

Besides its scenic drives, Turkey Run State Park, in western Indiana, has 30 miles of foot trails. Some lead through dense forests; others along bluffs, or through steep-walled canyons where sun never strikes.

charms as subjects for their pictures. Early-day roadways wind among hills and rich valleys; a water wheel runs a flour mill, and about an old, old church forgotten settlers sleep in nameless graves.

At night we took a side road to visit an old-fashioned square dance. Long before we reached the abandoned schoolhouse where it was held—set away back in the woods on a forking muddy road hard to follow—we could hear the shouts of the man who "called the measures," the spontaneous musical combustion of what they call down this way a "gully jumpers' band," and the heavy "stomp" of bucolic feet. Many of the boys were in shirtsleeves; of the forty or more girls not one smoked cigarettes between dances!

"How many measures can you call?" I asked the man, hoarse from such cries as "Swing your partner," "Grand right and left," "Cage that bird," and "All promenade!"

"Oh, I could call all night and never repeat."

Sheep licking rock salt in the shade of white oaks; log barns hung with tobacco; barefoot boys fishing under a bridge, using poles cut from the brush with jackknives; a fence-jumping cow grazing in her clumsy yoke—all this country life flashed past next day as we rode down to the Ohio (p. 300).

James B. Eads, named by Lincoln to build ironclads in the Civil War, was born here in 1820, says a tablet at Lawrenceburg. He is better known for his bridge at St. Louis. Thousands of barrels are stacked here, and the morning air is strong with the breath of big distilleries.

To the memory of Col. Archibald Lochry and his command who were massacred here in 1781, notes another tablet near Aurora. And so on through the old, old town of Rising Sun, and along a winding river road.

OLD RIVER TOWNS HUG THE OHIO

Downstream puffed the packet boat, from Cincinnati for Louisville, crowded with Sunday excursionists. Women waved at us, and we heard music on the boat, and could see white-jacketed waiters sidling through the deck crowds, carrying trays.

In Vevay, where Swiss wine makers colonized in 1802, a hybrid European and ante-bellum spirit survives.

"Yes, I spoke French to my parents till I was eight," said a young lady. "We still have a wooden clock and dishes that my ancestors brought from Europe."

Edward Eggleston was born here; they show you the house.

"Did his sketches of local characters in 'The Hoosier Schoolmaster' offend people here?" I asked an old native.

"I never read it," she said.

"It went into many foreign languages, and on the stage," I parried.

"Maybe so—but I don't know anybody here that's read it."

Like the Rhine above Koblenz, the Ohio, passing Madison, winds through rolling green hills. Through glasses you can see people across the river, in Kentucky, going about their affairs.

LOST AT SEA: A LOCOMOTIVE!

When the State's first railroad was built north from here, the first locomotive, sent from Philadelphia, was lost at sea; the next got here, up the Mississippi and Ohio, but had to be dragged up the bluffs by oxen to the new railroad. . . . When Jenny Lind sang here, the only place in town large enough to hold the crowd was a pork-packing shed. . . . Mayor Sulzer showed me daguerreotypes of famous New Orleans packets, made 90 years ago. . . . "Grow old along with me; the best is yet to be," says a line on the rim of an old sundial.

For years Madison was a center of culture and aristocracy. Preserved now as a State memorial is the palatial home of James F. D. Lanier, who helped finance Indiana through the Civil War (Plate III).

Ginseng, goldenseal, mandrake, and some 250 other medicinal roots, barks, herbs, leaves, flowers, and seeds are bought from thousands of farmers by a pioneer drug firm here.

"Patent medicine makers are also heavy users," said the druggist. "I buy everything from Texas snakeroot, wahoo bark, and slippery elm to Carolina sassafras. Indians cured themselves with many barks and roots commonly used now by the great pharmaceutical factories. But Nature can no longer supply all the crude drugs the world needs; hence, many must be made synthetically."

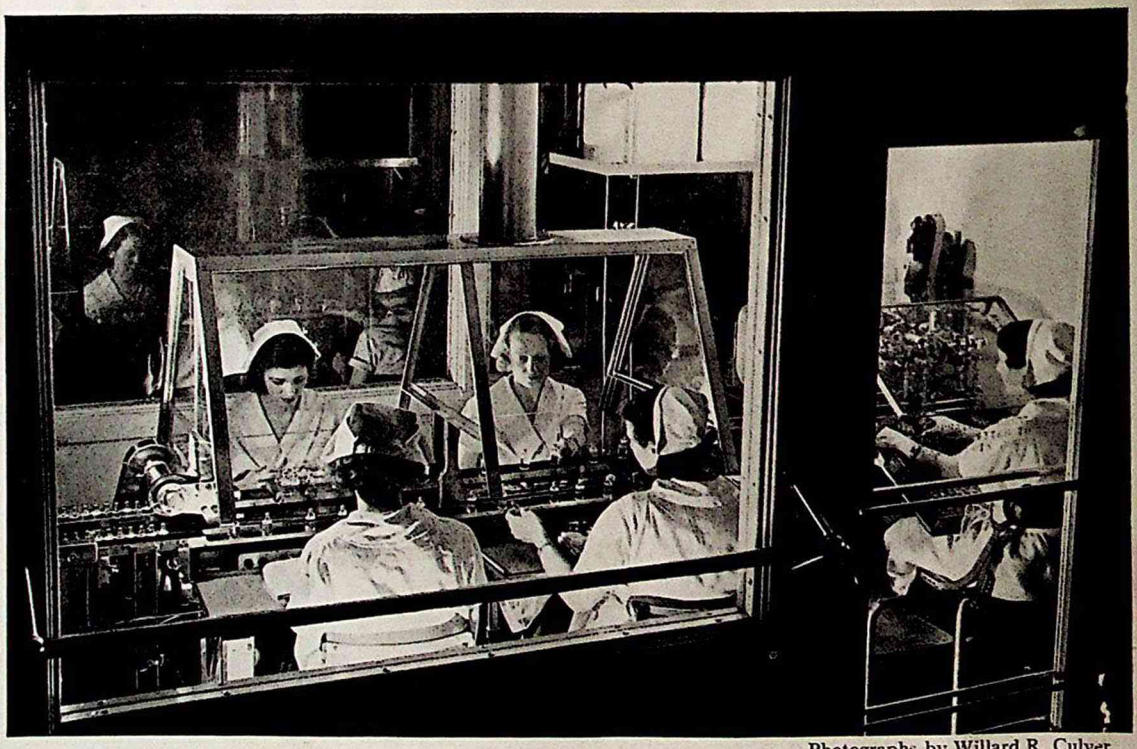
Mints that supply most of the whole world's chewing gum and other needs come from Indiana (page 316). Hay is made from the weed, after the mint juice is pressed out; eating it, cows roll their eyes and nod their heads in obvious enjoyment.

All these old river towns were born of river traffic. The oldest houses in any of



THIS MAY BE FUN FOR THE BOYS, BUT IT'S A PAIN IN THE NECK FOR THE GOAT

"Sure, we broke the billy goat, my brother and me," said Donald. "We make him help, too, here in the garden." Plowing peas on a farm near Bargersville.



Photographs by Willard R. Culver

TO INSURE STERILITY, INSULIN VIALS ARE FILLED AND CAPPED IN A GLASS-ENCLOSED ROOM SUPPLIED WITH FILTERED AIR

Control of diabetes by injections of liquid insulin was announced in 1922 by Doctors Banting and Best of the University of Toronto, Canada. Now vast quantities are prepared from the pancreas of cattle and distributed wherever needed by Eli Lilly and Company of Indianapolis (p. 281).

them are usually those that face the Ohio. Many are dilapidated now, given over to ragged wharf rats and shiftless fishermen. When the "floating palaces" of Mark Twain's gilded age plied between Indiana and New Orleans—crowded with wealthy planters, their families, and servants, with busy traders and card sharks—these river ports grew noisier and more opulent. That all faded when the steamers yielded to railroads.

More tonnage than ever rides the Ohio now, but it is mostly heavy through cargo from Pittsburgh, hauled on flocks of barges that ignore these pioneer Hoosier ports.

Old women with rakes and scythes were clearing weeds from graves when we got to Pigeon Roost Memorial. Here sleep women and children massacred long ago by Indians. Men named this mournful hill for myriad wild pigeons that used to roost here. My mother's father, who came to Indiana as a boy from the Isle of Man, used to tell how, with guns, long poles, and smoke, they killed these now extinct passenger pigeons for food, by the bushel. Trees often broke under the weight of thousands of roosting birds.

On a fine bridge we drove across to Louisville for dinner. Coming back to Jeffersonville, we noticed a sign on the Indiana side, "Marriage Parlor."

"That's where Louisville youngsters come to get married in a hurry," said a filling station worker. "Many couples that don't stop there hurry on to the dog races, or the crap games. . . . I remember when lots of Kentucky people came here to hunt. Now, it seems to me, most of 'em go to see the dogs run that *toy* rabbit."

After New Albany, with historic Hole Tavern where Daniel Webster, Henry Clay, and Andrew Jackson stopped, we came to Indiana's first state capital at Corydon, restored now, just as in 1816. A friendly town, Corydon; everybody you meet speaks to you—a quaint and pleasant custom.

Going west for Evansville, we saw Santa Claus—a town of less than 60 people, whose odd name has made it known to newspapers across the continent (p. 317).

WHERE LINCOLN SWUNG HIS AX

Farther west at Lincoln City is Abe Lincoln's boyhood home, where he lived from seven to twenty-one. Here is the monument to his mother, Nancy Hanks, and the site of the cabin where she died. I walked about some of the paths, and tried to imagine what Lincoln's thoughts were when this great American trod these lonely slopes, ax on shoulder, on his way to split rails.

Coal mines crowd right up to the edge of Evansville. Astonishing to visitors, too, is the unique Mesker zoo, some of whose animals are trained and give regular shows.

Think of elephants and chimpanzees doing circus tricks out in their own free habitat, with no bars in sight! That's the impression you get here, if you come suddenly, while a performance is under way, to this zoo where animals are restrained by hidden, unscalable moats.

More important to Evansville, of course, are its five railways, its 100,000-plus population, and its forests of factory chimneys. Baby food, steam shovels, auto trucks, gas engines, refrigerators—all are made here. Its new Mead Johnson Terminal is one of the largest inland transshipment ports on the Mississippi system. Daily, over the new five-mile, three-lane bridge that links this city with Henderson, Kentucky, flows a heavy travel stream. Here is the shopping center for western Kentucky, southeastern Illinois, and southwestern Indiana.

TINY NEW HARMONY'S MANY ADVENTURES

Odd is the tale of New Harmony.

Here is a big rock with bare footprints. They look human, but they were left there by the Angel Gabriel! So said George Rapp, a Nürnberg religious leader who colonized his German followers here in 1814.

In the form of a Greek cross, its pillars carved from giant trees, the Rappites raised a temple, at that time a vast structure for these parts. It is gone, but their loopholed fort and many other interesting old houses still stand. When the Rappites had built up a prosperous colony, they sold out in 1825 to Robert Owen, British reformer and philanthropist.

It was under Owen and his followers that the village was to gain fame here and in Europe.

To this day, with its 1,200 people, New Harmony gets more space in encyclopedias than many places fifty times its size.

To this obscure hamlet, Owen, by his social experiments and teachings, drew scholars from many lands. One such was William Maclure, founder and for thirty years president of the American Academy



Photograph by Willard R. Culver

HOOSIERS WHO DIED IN THE REVOLUTION, IN 1812, IN THE MEXICAN, CIVIL, AND SPANISH-AMERICAN WARS, ARE HONORED BY THIS MEMORIAL

Known as the Soldiers' and Sailors' Monument, and recognized as a masterpiece of the sculptor's art, it rises 284.5 feet above the street. Cascades of flowing water form pools at the foot of the tower, which dominates a circle in the business center of Indianapolis.

of Natural Sciences at Philadelphia; another was Thomas Say, "the Father of American Zoölogy," who is buried here. Josiah Warren brought the first printing press, inventing here the "perfecting press" which prints from a continuous roll of paper.

Owen's original plan failed, for many reasons; but New Harmony long remained an intellectual center of the West and is still a mecca for students of social history. Until 1856 it was headquarters of the U. S. Geological Survey, later moved to Washington, D. C. Here in 1859 was founded the first woman's club in America with a written constitution. It was named "The Minerva," and its original papers are still preserved here in the "Old Fauntleroy Home," owned now by the Indiana Federation of Women's Clubs.

The "Workingmen's Institute Library" and the Murphy Auditorium attract endless visitors. Think of a library of 26,000 volumes in a town of 1,200!

Get to New Harmony in spring, if you can, and see that amazing floral shower that falls from a strange tree here and literally covers the ground with yellow blossoms. The seeds of this tree came from China, where people call it "the tree of golden rain."

And don't miss the whimsical *New Harmony Times,* known to columnists all over the State. Its weekly reprints of items from the famous *Disseminator* of 100 years ago are graphic glimpses of Hoosier life when Indiana was young.

BUSY CITIES LURE THOUSANDS NORTH

Overstuffed with history, we turned north; like thousands who have quit these older counties in the last forty years, I wanted to get up where Indiana works at higher speed, produces much.

"But be sure and stop at Austin, in Scott County," people urged. "It has a one-man miracle; his big cannery grew right through the depression." It *was* an eye opener: 85 big red trucks growling about a village, as if a circus were unloading. The whole town fairly smells of stewed tomatoes. For miles around everybody grows things for this one man to can—pork and beans, tomatoes, corn, carrots, things for soup. What a plant!

"My trucks run 165,000 miles a week," he said. "What they don't haul I ship by rail, coast to coast."

To print can labels he keeps 21 presses running; to supply him alone the American Can Company built here a special factory, from whence shiny new tin cans clatter and cascade by the carload. the trainload. Such a business!

RAISING GOLDFISH, DIGGING COAL

Men were shooting hawks and herons, and killing snakes with sticks near Martinsville, where we stopped next. Signs here proclaimed it "The World's Largest Goldfish Hatchery."

"They'd soon eat all our fish—if we didn't kill 'em," said a sweaty man who at that instant was clubbing two writhing water snakes. "Already this spring I've killed 84 of these boys. . . . Sure, we feed the fish: cornmeal, hard-boiled eggs."

Late at night we watched men in rubber boots sorting fish—separating males from females. I couldn't tell the he's from the she's even when the tired workers, with an air of mixed pity and boredom, tried to show me how.

Cruising leisurely through a region where carloads of rustic furniture are made from hickory saplings, pausing a while to watch a troupe of strolling players set up their tents for a one-night stand, we came to a wood astir with the sibilance of scenic Cataract Falls on Mill Creek. A spot of singular beauty this, good to look at after the open-pit mine scars that deface parts of western Indiana. To hide the ugliness where such "strip mining" has left its rough, naked ridges, the State in some spots is planting young trees.

"Did you dig that yourself?" I asked a farmer, who drove out of the low hills with a load of coal.

"Yeh. Just a shirttailful, to get a little change."

Hundreds do this, peddling the coal at prices below what the city coal yards charge.

Along an abandoned interurban electric railway we rode over to Clinton, where I called on Harriet. It was hard, after 27 years, to say much that made sense. But I felt at peace, as one may with boyhood friends. After long separation, you see companions of your youth as through a veil; yet personality, gestures, quick flashes of expression, all are familiar, unchanged.

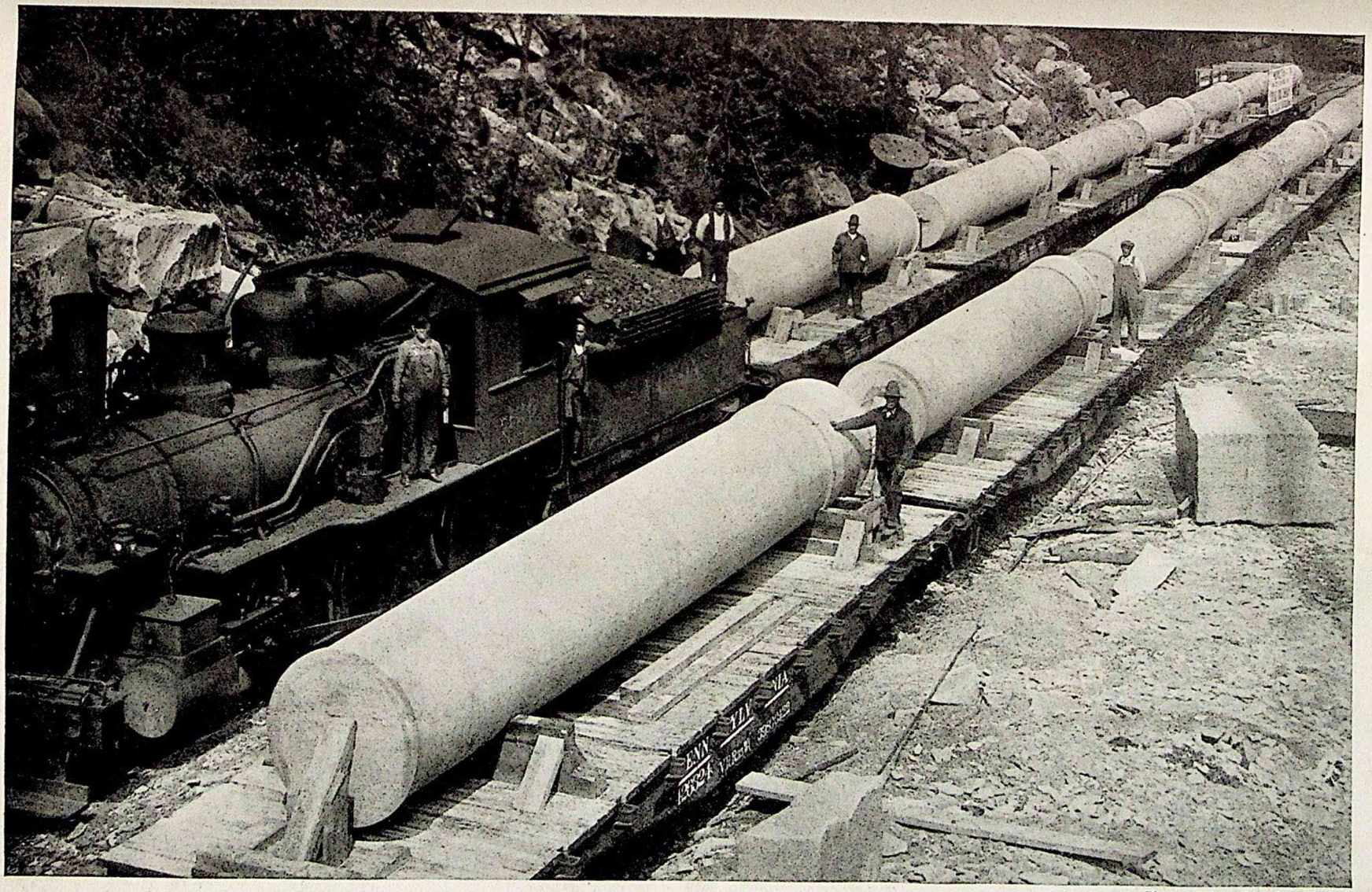
Clinton itself I hardly recognized; though it was hard hit in the depression, a generation has changed it from a sprawling,



Photograph by Willard R. Culver

INDIANA'S WORLD WAR MEMORIAL COVERS FIVE INDIANAPOLIS BLOCKS AND IS AN OPEN PLAZA SET WITH IMPOSING ARCHITECTURAL WORKS

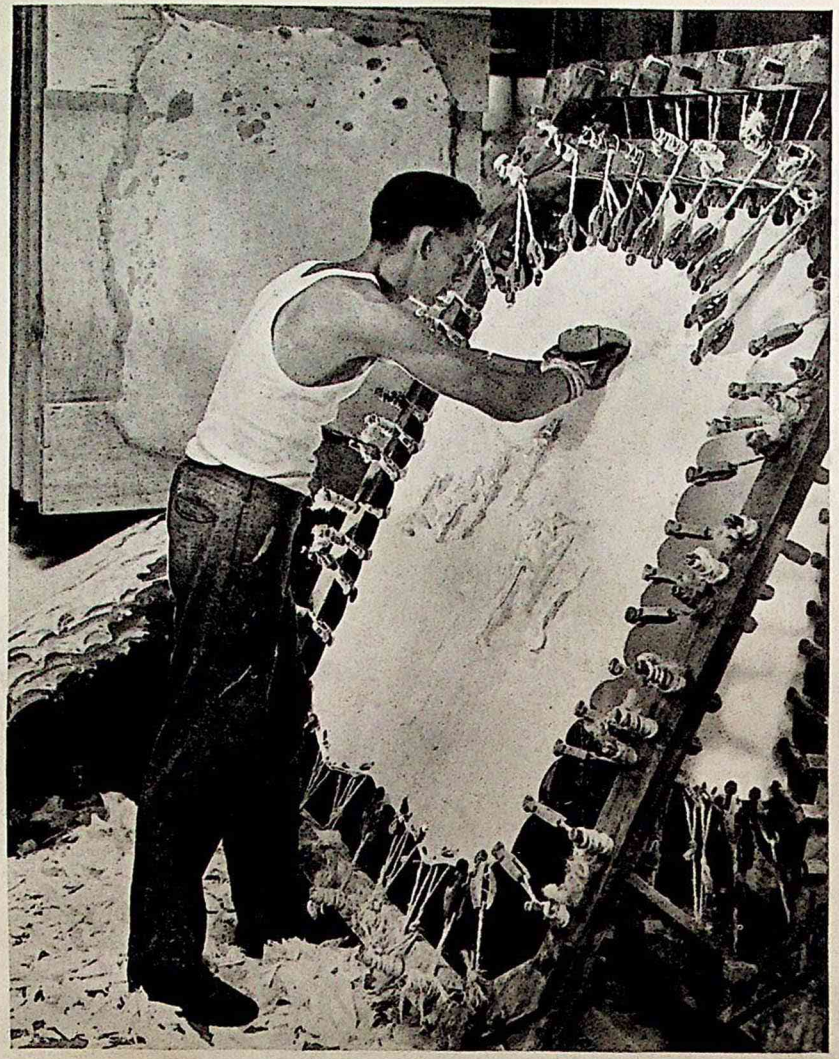
In the right background stands the main shrine, of Indiana limestone, on whose sculptured walls are depicted World War scenes. Here, too, are famous flags and portraits of distinguished military leaders of the Allied countries. At the left rises the 100-foot granite obelisk symbolic of the Nation's power. On the Memorial Plaza, but not shown here, also stands the American Legion's National Headquarters (Color Plate V).



Photograph by Tom Jackson

FROM GREAT LIMESTONE QUARRIES NEAR BEDFORD COMES THIS SOLID TRAINLOAD OF MONOLITHIC COLUMNS

On powerful lathes are cut these Gargantuan columns, each more than 35 feet long and nearly five feet in diameter. Ends are squared by huge saws whose teeth are set with black diamonds. For use in the Mellon Institute at Pittsburgh, 62 such columns were turned. Two sphinxes before the Scottish Rite Temple in Washington, D. C., were carved from blocks of Bedford limestone weighing 100 tons each. Other cuts have weighed up to 300 and 400 tons (page 275).



RAW CALFSKIN IS SCRAPED CLEAN AND THIN TO MAKE A DRUMHEAD

About one-third of all Elkhart is busy, in one way or another, with the production of musical instruments (Color Plate IX and page 315). To make drumheads, hides are bought by the thousands from Chicago packers. These are cleaned, cured, soaked, and then stretched on frames for scraping.



Photographs by Willard R. Culver

"IF YOU PRINT MY PICTURE IN THE GEOGRAPHIC, PLEASE SEND ME A COPY," URGED THE BOY

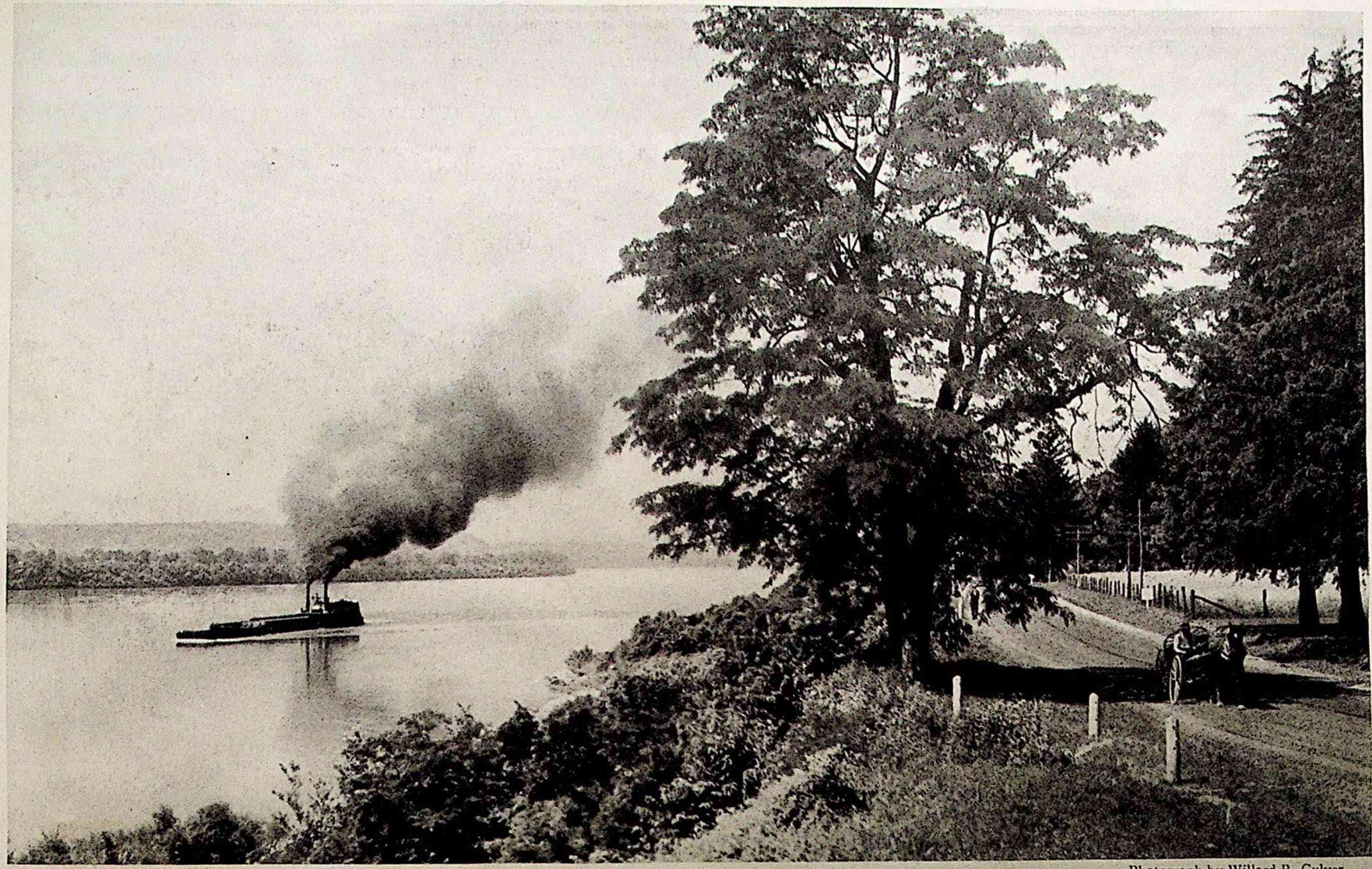
"We import young tomato plants from Georgia," said the driver of this planting machine. This gives the Indiana crop an early start. Another boy, not visible here, follows a few steps behind to straighten up any plant that is not left upright. "This beats the old backbreaking way," remarked the driver.



AP Photograph from Pictures, Inc.

SEVERAL TONS OF FOOTBALL TALENT LIMBER UP AT NOTRE DAME, KNOWN THE NATION OVER FOR ITS SUPERTEAMS

At this famed South Bend, Indiana, university, the tradition of the late Knute Rockne marches on and the athletes are drilled in the fast, thrilling "open game," with emphasis on speed and deception. Such calisthenics as this help to work out muscle kinks and develop fleetness. Resting nonchalantly on the back of your neck, you brace your hips with your hands and move your legs as if riding a bicycle upside down. In the midst of the sea of large cleated feet stands Coach Elmer Layden, in his playing days a member of the fast-galloping Rockne backfield known as the "Four Horsemen of Notre Dame." In Rockne's 13 years as head coach, he turned out five undefeated teams; his "South Bend Cyclone" roared from coast to coast, winning 105 games, tying five, and losing only a dozen times.



Photograph by Willard R. Culver

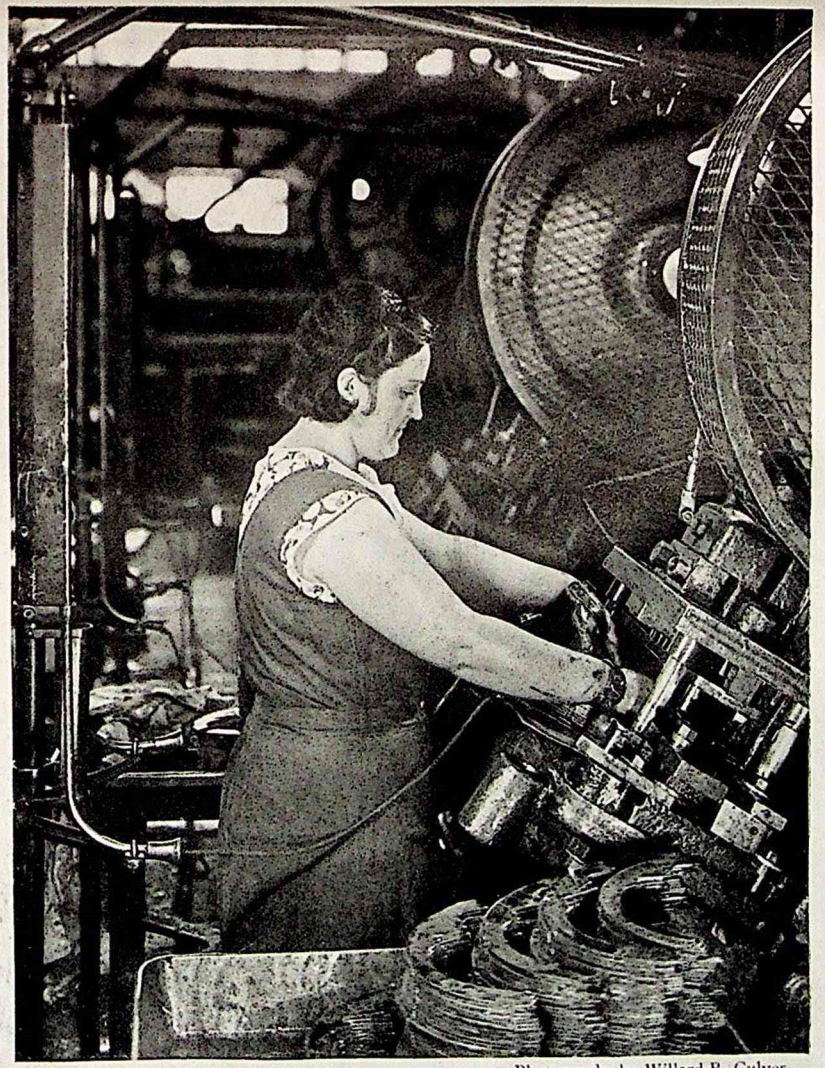
SCENIC HIGHWAYS PARALLEL THE TREE-FRINGED OHIO, NOISY WITH THE TOOTS AND PUFFS OF PUSHER-TYPE STEAMBOATS

Since the first white settlers floated downstream to conquer a wilderness generations ago, the Ohio has been a busy waterway. Today a single tow of barges may carry more coal and steel from Pittsburgh than could have been loaded on a hundred old-style stern-wheelers. Horse and buggy days have not passed from rural Indiana (page 318).



"YOU NEWCOMERS BETTER GO EASY ON THIS MINERAL WATER!"

Pluto water flows up in this pavilion in the landscaped gardens of French Lick Springs Hotel. Other springs at the famous "cure" are the Bowles and Proserpine. Located in southern Indiana, this garden spot has long been popular as a health center. Besides the hotel, the resort maintains its own airport, country club, trapshooting range, and other facilities for sport.



Photographs by Willard R. Culver

HANDCUFFED TO HER JOB FOR SAFETY'S SAKE

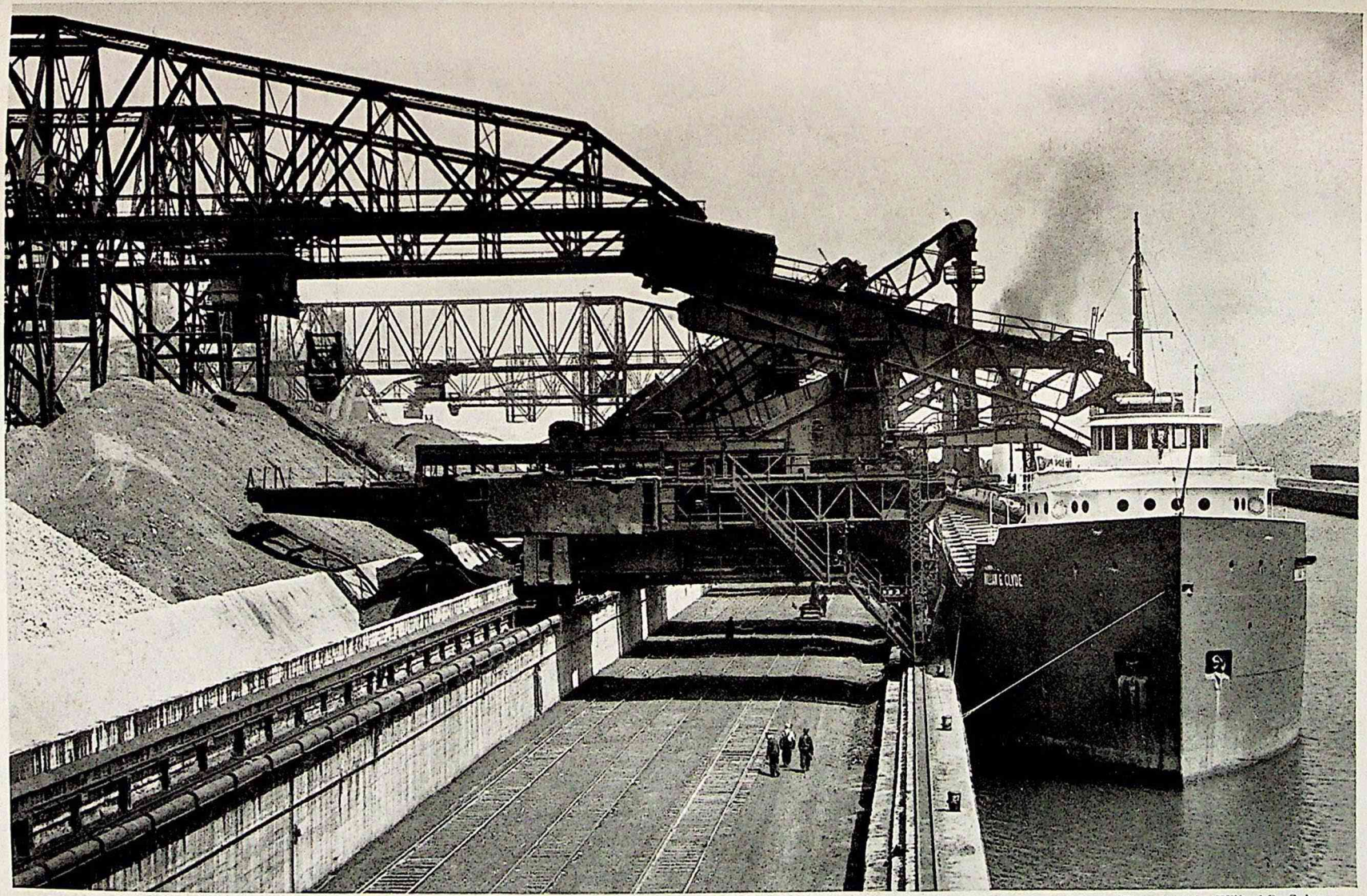
Operating a brake shoe machine in the South Bend plant of the Bendix Products Corporation, this girl wears "shackles." By electric connection the cords instantly jerk the hands back to safety should she be a split second late in withdrawing them from under heavy descending hammers, knives, or other dangerous moving parts (page 306).



Photograph by Willard R. Culver

THE "LINCOLN PIONEER VILLAGE" AS RECONSTRUCTED IN THE CITY PARK AT ROCKPORT, ON THE OHIO

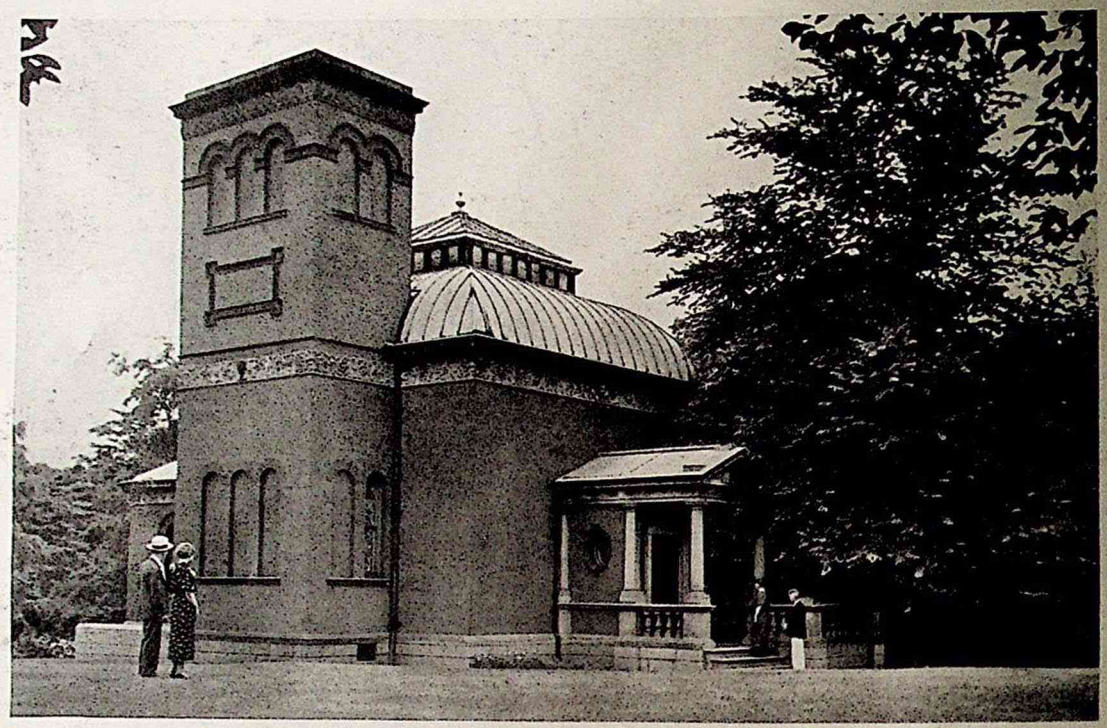
Observe the solid wooden wheels of the oxcart and the "mover wagon." Also there is the stockade, for Indian defense, and the open well with the teetering pole for drawing water. Log huts and a chopping block in the right foreground complete this picture of early-day Hoosier life. From the age of 7 to 21, Lincoln lived in such a village in Spencer County.



Photograph by Willard R. Culver

GREAT LAKES VESSELS BRING MINNESOTA IRON ORE TO THE CARNEGIE-ILLINOIS STEEL CORPORATION'S PLANT AT GARY

Huge buckets attached to the ends of booms dive into the hold of the ship, scoop up the ore, and dump it into a trough from which "ore bridges" carry it to the storage yard paralleling the dock. Operators are stationed on the booms and ride up and down, manipulating the scoops. Mounted on wheels that travel along huge tracks, five or six machines may work simultaneously on a single ship, unloading 10,000 tons in three or four hours (page 315).



Photograph by Willard R. Culver

GEN. LEW WALLACE'S SKYLIGHTED STUDY HOUSES MANY MEMENTOS OF HIS LIFE

Built at Crawfordsville after his return from the post of Minister to Turkey, this building shelters the original "Ben Hur" and other manuscripts. Here also are letters to Wallace from Abraham Lincoln, historic documents, and personal relics of the General's colorful career in the Mexican and Civil Wars and in diplomacy and literature.

ugly mining town to a neat, well-developed industrial center, with parks, playgrounds, and fine schools.

Through Turkey Run State Park, with its virgin forests, cool, glacier-scoured canyons between steep sandstone cliffs, and its crowds of Chicago vacationists, we went on to Crawfordsville, old home of Wabash College and General Lew Wallace (Color Plate VIII).

During the quiet afternoon I browsed in the studio where Wallace worked so long. Here are fascinating trophies of war, diplomacy, and literature—mementos of his curiously variegated and intensely active life. Among other letters and papers—many of singular value to students and historians—are original manuscripts of some of his books, which included such historical romances as "The Fair God," "The Prince of India," and the widely popular "Ben Hur."

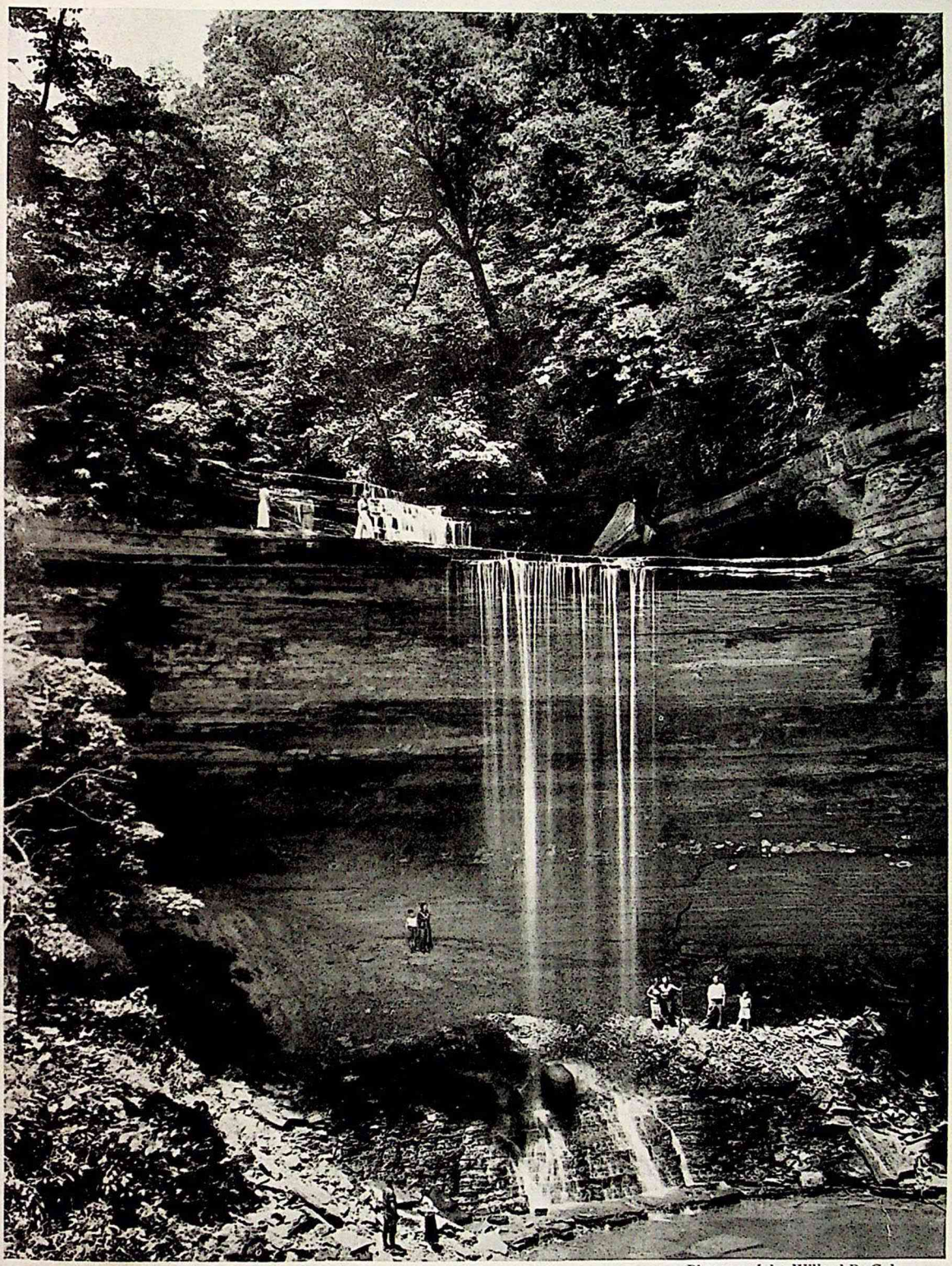
Past big red barns, owners' names proudly painted on their sides; past a sign that said, "Goose Eggs, 5 Cents"; past Holstein herds ruminating under friendly shade trees, we came to LaFayette. When yet a long way off we could see smoke from its packing plants, flour mills, and railroad shops. Here at West Lafayette is Purdue University (Color Plates I and VII).

Have you lunched lately with a horde of hungry college boys and girls? That *was* interesting, in Purdue's big cafeteria. All were laughing, chattering over plans and dates, skylarking and making current "wisecracks," with youth's audacity and apparent disregard for the Nation's hard problems that now keep their elders awake.

"OLD TIPPECANOE" FOUGHT HERE

Lapse of 125 years has healed bullet wounds made in trees on Tippecanoe Battlefield, near LaFayette, but the scars are still plain. Here William Henry Harrison—afterward dubbed "Old Tippecanoe"—beat back an Indian attack led by "The Prophet," brother of Tecumseh, the Shawnee chief, in 1811.

They show you the rock, at a safe distance from the battleground, where the Prophet sat and sang, and gave war whoops



Photograph by Willard R. Culver

BRIGHT AS LIQUID SILVER, THE DELICATE, SWAYING VEIL OF CLIFTY FALLS MURMURS AMONG THE LEAFY DELLS

Floods roar over this cliff only after heavy rains; normally the falls are but a lacy curtain. Clifty Falls State Park, on the Ohio River, is one of Indiana's many beauty spots. To Richard Lieber of Indianapolis, Hoosiers owe a debt for his early leadership in efforts to preserve such natural beauty spots as State parks for all the people.

to cheer his tribesmen, and assured them that his magic could make them safe from bullets of the "Big Knives," as Indians then called the whites.

With a long seine, men in hip boots dragged a shallow lake for carp as we came to the Jasper-Pulaski State Game Preserve. Putting the flopping, live fish into gunny sacks, they hauled them to what they call "the vermin cage," and fed them to weasels, minks, and foxes. Such varmints are usually shot, on the Preserve, but these were trapped and kept to show visitors.

"I trapped that mink," said a worker, "the same one, I'm sure, that in one night killed 160 pheasants."

INDIANA IS NOW DEEPLY AROUSED OVER RESTORING ITS WILD LIFE

Quail, pheasants, and rabbits are propagated here for distribution among the State's conservation clubs, and to individuals. We went first to see the rabbit farm; as we walked through it, droves of young rabbits scampered ahead of us, or crouched to hide, ears laid flat back, behind brush, weeds, or grass. Rabbits were everywhere. To an old hunter, it was like that familiar dream of finding money, with coins all over the ground. Two hired men sat around on stumps, holding loaded shotguns, shooting once or twice a week at hawks, which are gun-shy and keep out of range.

"What do quail eggs taste like?" I asked a foreman. He looked uneasy, and then said, "You'll have to ask somebody else; I hear they're pretty fair."

A quail egg here is valued at about 40 cents; a pheasant egg is worth 18 cents. The Preserve distributes game-bird eggs, as well as young birds. Last year they used about 2,500 chicken hens to do the hatching; now they employ huge electric incubators, with thermostats and all. Each one will hold 9,600 pheasant eggs or 14,000 quail eggs, and it takes 23 days to hatch them.

I made some trips afield with Mr. C. R. Gutermuth, Director of Education in the State Conservation Department, and heard his lectures to various clubs. Boys, farmers, village clerks, professional men, all listened closely, asking many questions. They not only wanted to know how to get young fish—of which many millions are hatched and sent out—but also how to get young game birds, or young trees, or where to raise wild rice.

After one debate a boy in gum boots and sweater got up and said, apropos of nothing, "I put out a 50-hook trotline this spring and caught 34 water puppies" (page 317).

That warmed the crowd up again to their favorite subject, hunting and fishing; and a warden got up to talk geese. "There's that open region of wheat and corn fields in Elkhart and Kosciusko Counties," he said, "where the Canada geese always light to feed. I saw five flocks in one day; I counted 126 in one flock, and there must have been 350 in another. They stay from late October till Christmas; but, boy, are *they* hard to sneak up on!"

That night we drove on to a little town called Plymouth. On the linoleum floor of a lunchroom, between cones and soft drinks, town boys and girls were dancing to the radio. You're told that 15 per cent of the people are on relief; yet I heard very few complaints about hard times, and food everywhere seemed abundant.

In one village I had excellent chicken stew, a big piece of rhubarb pie (there they called it "pieplant") and a choice of milk, tea, or coffee for 15 cents. "We've got plenty to eat," said the landlady. "It's money that's scarce!" In city hotels, of course, prices are about the same as elsewhere in the Middle West.

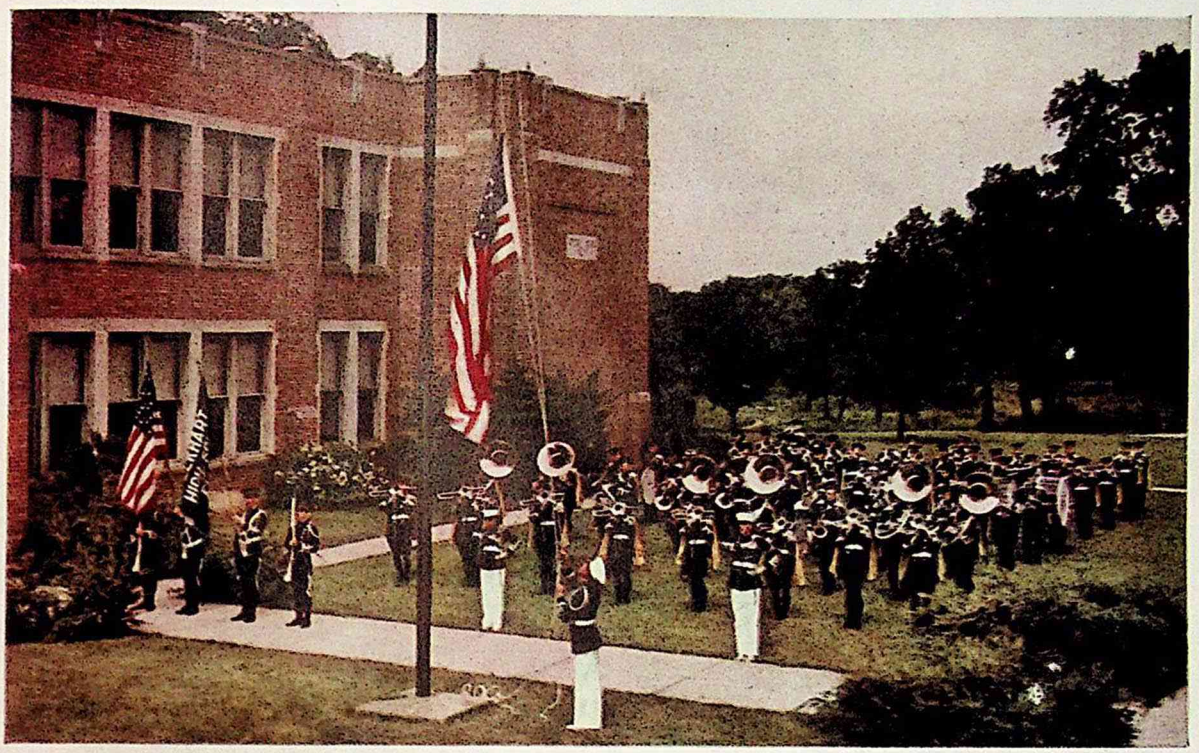
A PLANT SO BIG THE OFFICE BOYS WEAR ROLLER SKATES

In the vast South Bend plant of Bendix Products Corporation office boys on rollers skate for miles. Practically every plane flying passengers over America carries a carburetor made here, and most of them use such things as "bank-and-turn" and "rate-of-climb" indicators, barometers, artificial horizons, thermometers, etc., made by one of Bendix's many subsidiaries. Wheels, brakes, landing gear, testing and repair machines, all are fabricated here and sent to many corners of the world (p. 301).

Carburetors are built with the precision of watches; you see every one tested with gasoline.

"We don't dare work like head waiters, who come around asking, 'Is everything all right?' " said General Manager Maloney. "We have to *know* it's all right, before we let a flyer put one of our carburetors in a plane and take up a load of passengers."

Here the Studebakers founded what became the world's largest wagon works. Their stout vehicles were eventually used



AT ELKHART, THE HIGH-SCHOOL BAND PROVIDES MUSIC FOR A FLAG-RAISING CEREMONY

All these big horns, little horns, long horns, short horns, straight and crooked horns, drums, and other instruments were made in Elkhart. Such brass-band equipment is used by private musical organizations, and by armies, navies, and police in many parts of the world.



© National Geographic Society Agfacolor Plates by Willard R. Culver

BATHERS FROM LAKE MICHIGAN BEACHES EXPLORE THE WIND-BLOWN DUNES THAT PARALLEL THE SHORE

Mystery pervades this shifting arboretum, where storms and flying sands play tag with obstinate pines, oaks, and bearberry brush. Strangest of all is a small cactus, wandered here from some far-away home.



© National Geographic Society

Finlay Photograph by Willard R. Culver

COOL, REFRESHING SPINK-WAWASEE RESORT BORDERS LAKE WAWASEE, LARGEST OF INDIANA'S FRESH-WATER BODIES

Flyers can best grasp the locations and frequency of these lakes, with their hotels, speedboats, and summer colonies. Rushing across the State by motor, few travelers catch even a glimpse of this blue water; many do not suspect the existence of such locally popular lakes as James, Freeman, Shafer, Manitau, Tippecanoe, and Maxinkuckee.



© National Geographic Society

Agfacolor Plate by Willard R. Culver

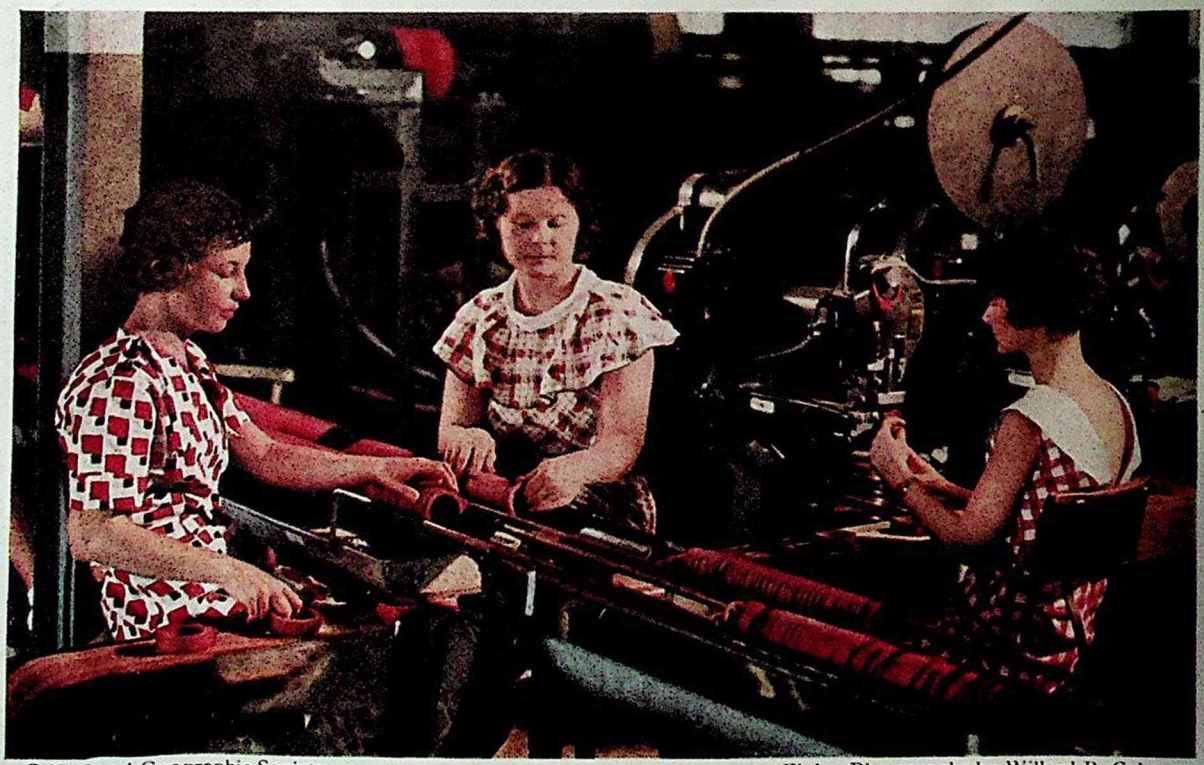
FLEEING CITY HEAT, TRAINLOADS OF CHICAGO PEOPLE SWARM OVER THE BEACHES OF INDIANA DUNES STATE PARK

Half-naked children wade along the shallow shore of Lake Michigan. Elders wallow voluptuously in cool, wet sands, smooth as a floor, or gorge on "hot dogs," pop, and beer. While running to catch the last excursion train back home, new-made friends shout agreement to meet here again next Sunday. Paralleling the lake front are lofty ridges that suggest a great rampart guarding "Duneland."



AN INSPECTOR LOOKS FOR FLAWS IN A WOMAN'S SILK STOCKING

Stretched over a moving form, the stocking is expanded by heavy pressure, and turned so the girl's trained eyes may catch any defect. Working in the Real Silk Hosiery Mills, at Indianapolis, this operator passes about 12 dozen an hour.



© National Geographic Society Finlay Photographs by Willard R. Culver

DAYDREAMING OF WEDDING RINGS WHILE THEY CUT RUBBER SEALING RINGS FOR FRUIT JARS

Moving along in an iron trough comes a rubber tube, from which a knife mechanically slices the rings. With clocklike precision women stack the rings, cut to fit millions of glass jars made at Muncie.



SHE FOOLS THE FISH BY PAINTING FROGS, MINNOWS, AND FLIES TO LOOK LIKE LIVE BAIT

First, in this laboratory of the South Bend Bait Company, a careful study is made of the habits of different fish. Then the anatomy and color patterns of insects and small animals on which the fish feed are painstakingly imitated in this skillful manufacture of artificial bait.

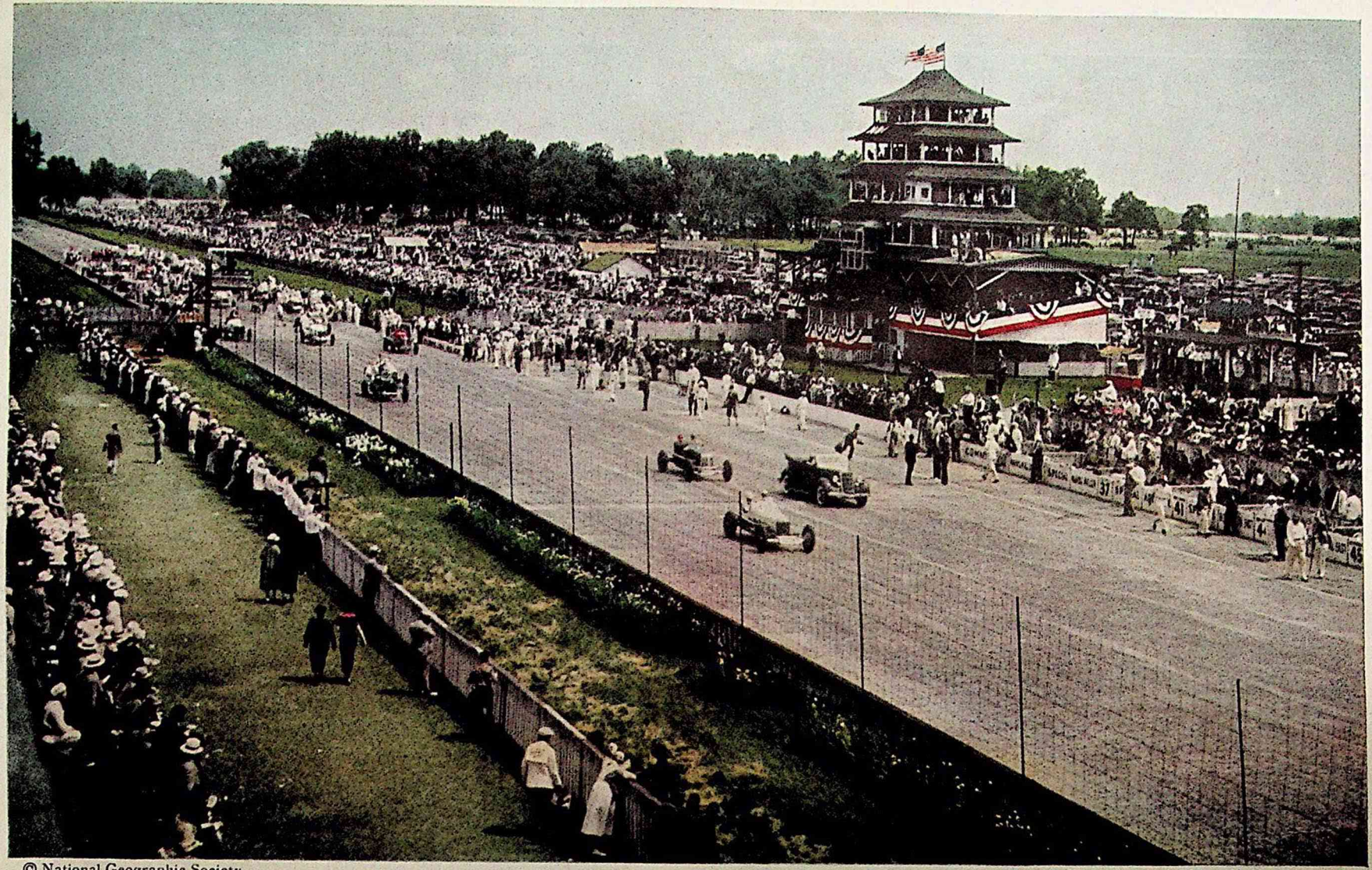


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Finlay Photographs by Willard R. Culver

TO BE LIGHT, STRONG, AND YET FLEXIBLE, FISHING RODS ARE MADE OF BAMBOO WRAPPED WITH SILK AND VARNISHED

Country boys, cutting their own poles, may catch fish just as big as any ever hooked by city folk on these fancy rods. But would country boys trade theirs for these shiny ones? Yes!



© National Geographic Society

Finlay Photograph by Willard R. Culver

THOUSANDS CHEER AS MOTORS ROAR AND DAREDEVIL DRIVERS START A 500-MILE RACE ON FAMOUS INDIANAPOLIS SPEEDWAY

Entrants are massed behind the starting line. A touring car running with the first racers to be off officiates only at the start, leaving the track after the first lap. Oil smoke, the drone of high-speed motors, and excitement fill the air. Year after year the two-and-a-half mile high-speed brick course has taught many new lessons in safety and strength in automobile construction to motorcar builders. Louis Meyer, of California, made a new track record last Memorial Day, achieving an average speed of 109.069 miles per hour. The original Speedway was constructed by Carl G. Fisher in 1909.

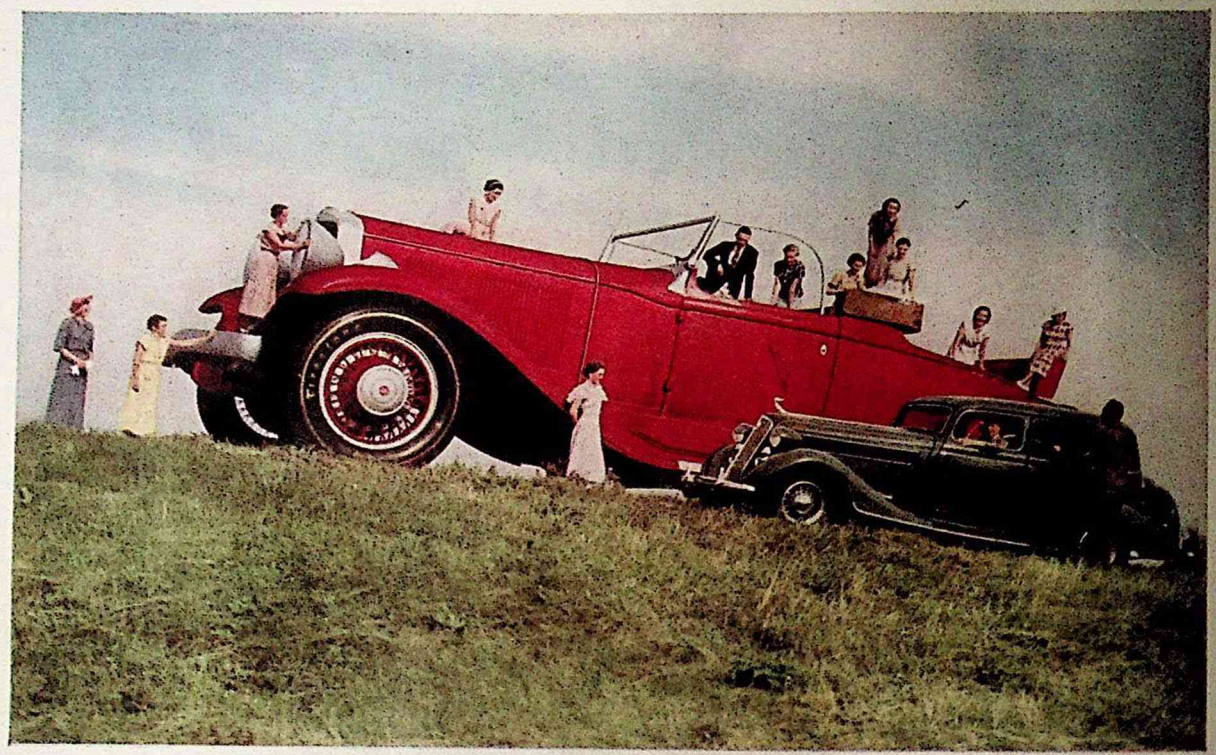


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Finlay Photograph by Willard R. Culver

THIS PLEASANT FARM SCENE, NEAR GOSHEN, IS TYPICAL OF NORTHERN INDIANA

The spacious tree-shaded home with modern conveniences; the great ventilated barn, its owner's name painted on it; and the good outbuildings, stout work animals, vehicles, and a heavy grain crop indicate comfortable living.



Finlay Photograph by Willard R. Culver

PERCHED ON THIS MONSTER MOTORCAR, NORMAL HUMANS SUGGEST THE LITTLE PEOPLE ON SWIFT'S ISLE OF LILLIPUT

Were cars really so large, pedestrians might escape by merely stooping to let the Juggernaut run over them! The mammoth stands on the South Bend proving grounds of the Studebaker Company.



© National Geographic Society

Agfacolor Plate by Willard R. Culver

THOSE WHO CAN TAKE THEIR EYES FROM THE GIRLS A MOMENT WILL SEE GLADIOLUSES

Near Goshen, Indiana, A. E. Kunderd, who developed the ruffled and laciniated types of gladiolus, grows more than 100 acres of these flowers. He exports bulbs to New Zealand, Australia, the Philippines, and Hawaii.

all over the Western Hemisphere, in all our wars since 1860, and in the Boer War. Now the automobile of that name is built here in great numbers (Color Plate XVI).

In and about South Bend roost some 45,000 homing pigeons. Clubs sponsor races each summer; the longest is about a thousand miles, from Abilene, Texas, back to South Bend.

Many poor fish would be alive today, could fish but see and know the South Bend Bait Company. Wooden frogs, mice, and minnows; artificial flies, every tidbit to tempt piscatorial gluttony and fool a fish that man's genius can conjure up is made here. In one popular lure, the "buck tail," they use each year the tails of more than 10,000 deer. Somewhere, always, there is the hook! (Color Plate XIII.)

Amid smell of banana oil and paint, long rows of girls work at wrapping split bamboo poles and painting spots on frogs, or putting glassy eyes on phony little minnows. In the manager's office, two sculptured human hands falter far apart on a panel, measuring "The One That Got Away."

THE MIRACLE OF GARY

The magic rise of Gary was like that of the made-to-order Manchurian town of Dalny (now Dairen) built by Imperial ukase. To Dalny, years ago, the Tsar sent not only men and materials to make a city, but goods for its new stores, and troops of players for its new theater—all by train across Siberia!

Gary rose just as instantaneously. It grew so fast that families moved into homes 24 hours after work started on them. To make lawns and gardens on the sand wastes, trainloads of black dirt were hauled in; grown trees were brought and planted. Steel mills rose; shiploads of ore came from up the Great Lakes. Indiana awoke to find steel her chief industry (page 303).

From the high, glassed-in shelter of a calm, alert operator who works giant machinery merely by pressing electric buttons, you can see three-and-four-hundred-ton, red-hot billets being hammered, shaped, and tossed about as a blacksmith might handle a horseshoe on his anvil.

Along with Hammond, East Chicago, and Whiting, Gary forms the "Calumet District," one of the Nation's chief industrial centers. Pipe lines from Texas, Wyoming, and other far-away fields bring crude oil here to our largest inland refineries.

East along Lake Michigan lie those odd-looking sand hills, the dunes (Plates IX and XI).*

"All this beach used to be so empty," said a retired artillery officer, "that we dragged our guns out on the hard sand and banged away. . . . Look at the crowds now! Sunday afternoon a red light may stop a line of cars five miles long."

Off Michigan City we saw a strange sight. Real estate men there had bought the "Colonial Village" from the Chicago Century of Progress, and were moving it—en masse—on barges, bringing it here and setting it up on the dunes. One house, on a bobbing barge, resembled Noah's Ark. But the bird that flew out of it was a gull, instead of a dove!

To Indiana Dunes State Park, Chicago pleasure seekers flock. So do Hoosiers; but various others play in and about the lakes fringed with summer hotels and cottages that dot northern Indiana (Color Plate X). Everybody fishes.

"I dig worms in the fall, put them in buckets of dirt, and store them in the cellar," said one man. "Then in the spring I have good, strong worms handy when the fish begin to bite." A boy said, "I earned high-school expenses catching and selling crickets." One signboard on the way to Pokagon State Park reads, "Fish Worms and Ice Cream!" The park, with its rambling Pollawatomi Inn on James Lake and its herds of elk and buffalo, is a favorite resting place on this crowded travel lane across northern Indiana.

ALL AMERICA BLOWS ELKHART'S HORN AND POUNDS ITS DRUM!

Whether you play the piccolo, pound a drum, or moan on a saxophone, you can buy one in Elkhart. One-third of all its citizens make these things. At the Conn plant we saw them dressing calfskins at the rate of 1,000 a week for use as drumheads; shaping every kind of horn from trumpet to bass; carving hardwoods for the reeds.

Elkhart equips army, police, and other brass bands for many countries overseas. It sends cornets and trombones to missionaries in China, Africa, and the South Seas, who blow the tunes that lead native

* See "Indiana's Unrivaled Sand-Dunes," by Orpheus Moyer Schantz, NATIONAL GEOGRAPHIC MAGAZINE, May, 1919.



Photograph by Willard R. Culver

TAKING MINT PLANTS FROM A STILL AFTER THE OIL HAS BEEN EXTRACTED

Such oil gives chewing gum its smell and taste! In northern Indiana about 19,000 acres of "muck land" are devoted to mint culture, and upwards of 250,000 pounds of oil are recovered annually. Plant residue makes good stock feed. This still is near South Bend (page 291).



Photograph from Indiana State Conservation Dept.

HERE THE CROW IS PUBLIC ENEMY NUMBER ONE

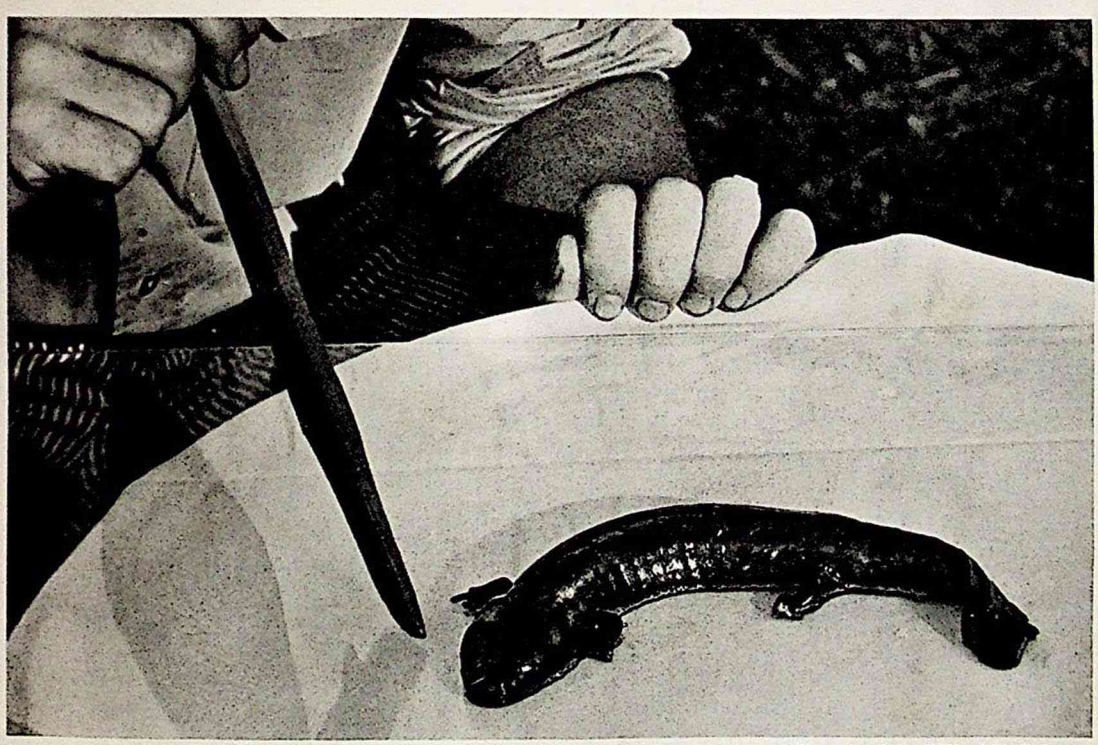
In a crow-control contest, this Evansville sportsman's club won first place. For crows' feet the State pays in cash or in live quail. From victims trapped, shot, and bombed, 126,000 crows' feet were turned in during one season.



Photograph by Willard R. Culver

OLD SAINT NICK'S EFFIGY ADORNS MAIN STREET IN SANTA CLAUS

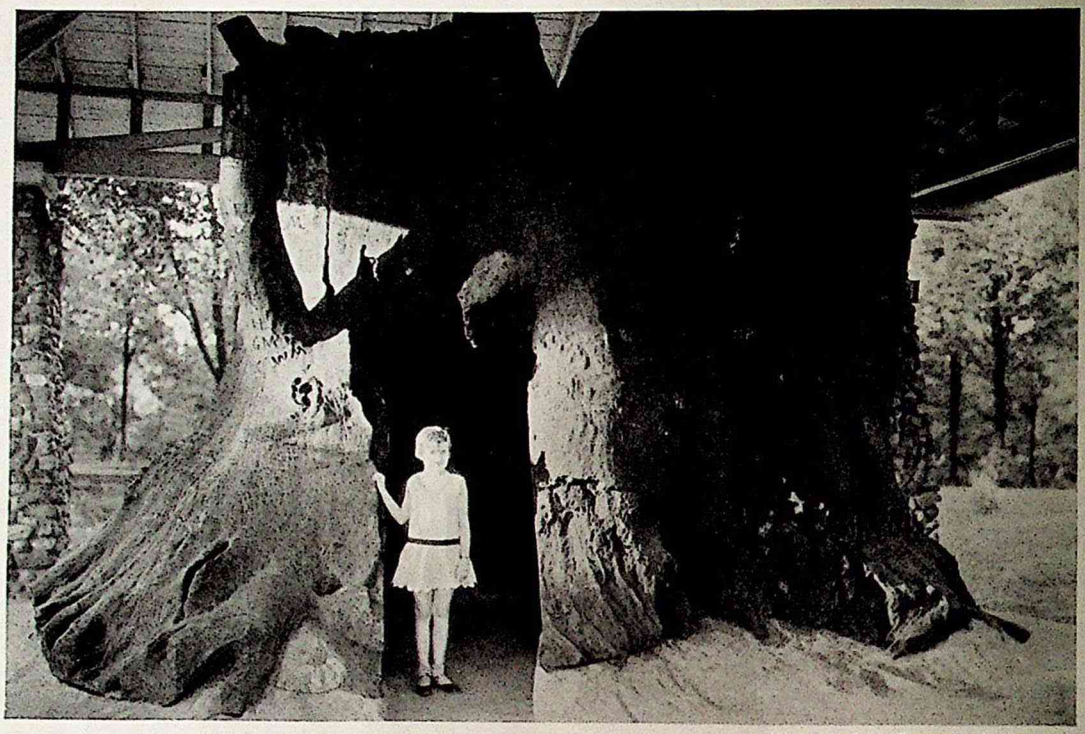
Inside the country store is the tiny post office, whose Christmas mail is so heavy that extra clerks are hired to open the flood of letters sent to "Santa Claus." The Post Office Department authorizes this, and kind people everywhere help meet children's appeals.



Photograph by Willard R. Culver

EASILY CAUGHT ON HOOKS, "WATER DOGS" ARE A NUISANCE TO FISHERMEN

Known also as "water puppy," the salamander attains a length of 12 to 14 inches, and has a skin instead of scales. It inhabits muddy lake and river bottoms, and at mating time may crawl out on the banks. It eats fish eggs, small fish, worms, and insects.



Photograph by James A. G. Davey

THIS GIANT SYCAMORE, 56 FEET IN CIRCUMFERENCE AT THE BASE, STOOD IN LIFE NEAR KOKOMO, INDIANA

It was one of the largest broad-leafed deciduous trees on record; perhaps its huge size saved it from the woodman's ax. After death, this trunk was moved to Kokomo City Park, and a shelter built over it. Rich Indiana corn lands once grew magnificent hardwood forests. Pioneers wantonly burned these walnuts, oaks, hickories, and others to clear farms.

converts in singing hymns (Plate IX and page 298).

Set on clear, winding St. Joseph River, Elkhart is a cheerful, wholesome place of abundant hospitality.

Each autumn on Main Street, Elkhart children hold a pet parade. Every boy and girl in line must ride, drive, lead, carry, or drag some kind of pet—any living thing from pony, calf, dog, lamb, monkey, cat, or coon to birds, fish, turtles, and snakes.

On a tombstone is a simple and touching epitaph to one who through long, patient years of schoolroom toil helped Elkhart youngsters on the road to education: "School Is Out; Teacher Has Gone Home."

Riding south among scenic lakes and summer resorts, we saw this signboard: "Peru, 1 Mile. Hot-cha!" Here a circus winters. During a flood many animals escaped.

"Was I worried about my kids!" said a wag. "Billboard posters showed bears riding bicycles. 'What chance would my children have,' I thought, 'with runaway bears chasing them on wheels!' "

In a roadside creek C. C. C. boys were spearing carp. . . . In the next village was a harness shop, with a buggy-whip rack, from which shiny new whips hung by their crackers. Astride his harness maker's "horse," a man was stitching a new "tug."

"Do you *sell* buggy whips?" I queried.

"Sold 24 this spring, and over 50 sets of new harness. Sold more harness this spring than for years. Old Dobbin is coming back. Dozens of saddle clubs have sprung up all over the State."

From the top floor of the cloud-scratching Keenan Hotel in Ft. Wayne you look out to where Frenchmen built huts in 1686. Named for Mad Anthony Wayne, standing where the St. Joseph and St. Marys Rivers join to form the Maumee, this is a smoky railway center, with car and repair shops. Once our largest Indian trading post, it sees thousands work now in a great General Electric plant, known locally as "The Lights." Others gain their livelihood in foundries, knitting, planing, sash-and-door, flour, and woodenware mills.

Buying some lunch to eat on the road, I saw a crate of whitish melons. "What are these?" I asked a clerk. "Just melons," he said, "from some foreign country; I don't know where. It says on the box." I stooped and read the name of a fruit-growing concern in Chile.

The text was in Spanish. Suddenly three Mexicans in overalls stood beside me, also reading; and one said to another that these melons, too, had made a long voyage.

"Caramba!" I said. "How did you get so far from home?"

"We drove from Texas, in an old truck."

"But you speak another tongue—and many who live here are already idle. Can you find a job?"

"We got one, right away, in the sugar beets."

Land hereabouts is called Indiana's best. No abandoned farms; no dilapidated barns faintly painted with names of plug tobacco or liver pills that went off the market years ago; instead, fine houses, silos, big barns, fat stock. Down toward Bluffton, we talked with farmers who made fortunes in the oil boom, and with others who came here long ago, in the sensational early days of natural gas. Older people remember the excitement and the alarm of some who believed the burning wells meant the end of the world!

Muncie boomed when gas was struck. Gas was so cheap that people didn't bother to turn it off. You could heat and light a large house for one or two dollars a month. Industries flocked here, and Muncie became a world center of glassmaking. It still is (Color Plate XII and page 281).

Also, despite dire warnings that man's reckless waste of gas would ruin this whole region, nothing of the kind happened. It still hums with factories; in the gas belt certain boom-time industries folded up, but others have risen.

MOTOR "DERBY" DRAWS HUGE CROWDS

Indianapolis was choked with men, women, and automobiles when we got back. Throngs who couldn't find rooms walked the streets through the night, pushed their way into crowded cafes, or sat in parked cars. Few slept. Till dawn all hours echoed with shouts, songs, honking horns, radios, and the shrill "Extra" cries of newsboys. All this because next day, on a dangerous speedway, famous racing drivers would contest the "Kentucky Derby" of the motor world (Color Plate XIV).

Squeezed among cars from Hollywood, from Maine and Mexico, we worked our slow way into the Speedway grounds hours ahead of race time, and I helped my photographer boost his heavy gear up to a grandstand roof. Other brethren of the lens were already perched in strategic spots. I saw one fall down a ladder, camera and all.

Passes to the "Press Pagoda" had been sent us. But long before the race was to start, this pagoda was so full of newspaper men and the "I-used-to-be-one-myself" group that we couldn't get seats. That didn't matter. Here were 157,000 excited people, sprinkled with world-famous sportsmen, flyers, and actors—plenty to see, photograph, and talk to.

500 MILES OF DESPERATE SPEED

First came a big parade, with a brass band of 1,200 pieces, and a long line of rumbling artillery. Then all the racing drivers posed for the camera.

Then bang! Not quite so soon, but "Bang" anyway, and they're off!

What daredevils of the roaring road! What desperate hunger for fame and riches! Death beckons at every oil-soaked curve, yet with heavy foot they press for utmost speed over the blistering bricks.

Spinning about the course like marbles whirled in a dishpan, roaring past the cheering thousands with motors growling loud and hoarse as mammoths from another age, they run so fast it makes your eyes ache to watch them. Fleeting glimpses only you get of grim, dirty-faced men in steel "crash helmets" driving diabolically, the back wheels of the whizzing cars jumping up and down like pneumatic hammers. One man drives so fast that a part of his mechanic's shirt is torn away by the wind.

Crowds rise in their seats and cry out as two cars on the south turn go into skids; streaking along at 100 miles an hour, they slide clear across the track and up to the very top of the retaining wall, only to be skillfully righted and hurled back into the fray.

Then women scream again, at a different curve. Some faint, and groups of spectators quit their seats. Over the wall a car has vanished. Its driver is dead, and his mechanic's back is broken. Shrill sirens



Photograph by Willard R. Culver

"SCHOOL IS OUT . . . TEACHER HAS GONE HOME"

So reads the simple epitaph on the modest tombstone of S. B. McCracken, long a teacher in Elkhart public schools, and much beloved by that city (page 318).

make way for police, doctors, an ambulance; signals to racing cars warn them to "slow down till the track is cleared." And then on; they know that in this game death takes few holidays.

An Italian from California wins. Starting with 33 others, he has taken those deadly curves 200 times, at an average speed of more than 106 miles an hour—despite "slow" orders from rain and accidents.

Since Carl G. Fisher, James A. Allison, and others built this two-and-a-half-mile Speedway 25 years ago, it has seen many a man gamble with death and lose. On the other hand, many a mechanical refinement which now makes cars safer and easier to drive came into use from lessons learned here.

Observing this crowd of 157,000 for five hours was my best human-nature lesson in all Indiana. Rome, when it raced chariots or threw Christians to the lions, no doubt behaved much the same. Some shouted in frenzy, calling to favorite drivers by name as they flashed past. Others gorged themselves from baskets of cold chicken, ham, cake, and fruit—and then hunted a shady place for a nap. Some sat in automobiles, listening to radio news of distant ball games.

"I've not missed a race in 17 years," I heard a woman say. "All the people I know in Indiana come, and this is the only place I can see them all at once."

"If there *must* be accidents," said another, "I might as well see them."

Again, in the city that night, the crowds bought extras, and, after the manner of Americans, read about the race they had just seen. At the Athletic Club was a dinner dance for the Governor and distinguished visitors who had come to share this greatest of all Hoosier holidays. All over town, thousands were packing their bags into cars; outgoing travel jammed the roads. For me, too, it was the end of an Indiana Journey.

A MODERN DRAGON HUNT ON KOMODO

An English Yachting Party Traps and Photographs the Huge and Carnivorous Dragon Lizard of the Lesser Sundas

By Lady Broughton

With Illustrations from Photographs by the Author

ONE of the most prized inhabitants of the London Zoo had died—a dragon lizard from the island of Komodo.

As the zoo was eager to replace this interesting creature, rare in captivity, Lord Moyne, who had visited Komodo some years previously, agreed to revisit the island last year with the object of securing specimens. I had the good fortune to be one of Lord Moyne's guests on his yacht *Rosaura* and to have opportunity to take the accompanying photographs.

SURVIVORS FROM PREHISTORIC AGE

It was only in 1912 that the Komodo dragons *(Varanus komodoensis)* first became known to zoologists. These large carnivorous reptiles, of a kind that crawled the earth millions of years ago, have been hidden away for ages in remote islands of the Netherlands Indies.*

Although *komodoensis* is only one of the existing species of *Varanus,* it is by far the most spectacular, because of its great size and its general appearance which vividly suggests the fire-breathing dragon of legend. Perhaps such a reptile, with curling tail and long, forked, flamelike tongue, for thousands of years inspired Chinese artists in picturing the traditional dragon (pages 325-327 and 330).

The creatures are found at the western end of the large island of Flores in the Lesser Sundas, and on smaller islands of the same group, notably Komodo and Rintja, which lie between Flores and Soembawa. Strong currents rush northward through the straits, past the dragon islands, at a speed which in former times must have discouraged ships from attempting a landing.

We anchored in the great sweep of Telok Slawi, a bay off one of the two small villages of Komodo. The scenery is of extreme beauty. Steep, green slopes of fantastic shapes run up with many curves and contortions to the rocky saddles which divide up the island (page 328).

The Netherlands Resident of Timor, responsible for the government of these islands, kindly came to Komodo in his yacht with several of his officials while we were there, and our success in capturing the "dragons" was mainly due to the help of our obliging friends.

We spent about ten days on Komodo in our effort to catch the largest possible specimens. We secured seven, but, as we had permission to bring back only three, we released the smaller captives whenever we could replace them by larger ones.

We used a trap which was constructed for the purpose by the zoo. Ten feet from front to back, it was built up of panels of strong wire netting and was so devised that, when the quarry pulled at the meat at the inner end of the cage, a door would fall behind it.

TRAP IS SET NEAR A DRAGON LAIR

This device we erected about a mile inland, just where a valley began to narrow into the foothills, and carefully camouflaged it with branches of trees. A great rock stood on a slope near by, and beneath it were several holes with tracks at the entrances which proved them to be lairs of these reptiles.

Owing, no doubt, to the many tracks we had left on the ground, no dragons came to the trap during the first twenty-four hours. We afterwards found that, although so deaf as to be completely indifferent to the human voice or even the discharge of a gun, they are possessed of keen sight and scent.

Another reason for their absence during the first day was doubtless the fact that

* See "Stalking the Dragon Lizard on the Island of Komodo," by W. Douglas Burden, National Geographic Magazine, August, 1927.

the meat had not begun to be odorous! Dragon lizards like it in a state of advanced putrefaction.

During the second day, however, we found the bait gone. The door had fallen without catching the dragon, although the creature had left plenty of evidence of its visit inside the trap.

We were never able to explain this escape. The trap was so designed that, once the door had closed, a steel catch made it impossible to raise it from below. If the door had fallen on the tail of the visitor and been pushed up again, the reptile must indeed have been of monstrous size, as the door was far too heavy to be raised by anything so slender as the last three or four feet of a dragon's tail.

It is, of course, possible that two walked into the trap together and that, while one ate the bait and sprung the trap, the other received the door on its shoulders. In that case, the first one may have turned around and escaped through the opening while its companion was disengaging itself.

Disappointed with this initial trial of the trap, we thought it best to arrange for a watcher while we went off in search of other likely places where we could try our luck with meat baits and nooses.

Finding lizard tracks on the beach at another part of the island, Lord Moyne shot two wild pigs, and three nooses were set in front of the carcasses. These snares were so arranged as to catch a medium-sized dragon lizard just behind the shoulders.

Returning later in the day, we surprised two small dragons feeding on the carcass. I was able to get a picture of one before they made off.

Then, to our astonishment, we found a seven-foot crocodile lying strangled by one of the nooses. We were much surprised at this, as we had no idea that there were any crocodiles in the bay or that these reptiles would live entirely in salt water. It was March—the rainy season, so we were told—yet there were no running streams on the island.

DRAGONS LEAVE A "GRAPEVINE" TRAIL

Fascinating was the study of the tracks on the island's many beaches. We soon learned to distinguish between the spoor of the crocodiles, with the tail-groove centered between a straight line of footmarks, and the wavy tracks of the dragons, which remind one of the conventional decorative treatment of grapes and vine tendrils. Lizard footmarks in the sand are the clusters of grapes, while the curves made by the tail, sweeping from side to side, resemble the tendrils (page 329).

We soon discovered that the larger lizards are by no means restricted to the mountain tops, as some previous observers had suggested. Not only small ones but also the twelve-foot giants come right down to the beach.

A FIGHTING CAPTIVE

It was an exciting moment when our trap watcher came to report a catch! On reaching the trap we found that the dragon was of only moderate size, but very fierce. As soon as anyone came near, it dashed itself against the wire sides of the trap, causing us extreme anxiety lest it should injure itself.

After a consultation as to the best method of getting it to the ship uninjured, we thought it best to collect a dozen natives and get the trap carried down to the sea on their shoulders (page 324). It would not be pleasant to be bitten or wounded by the powerful claws of these carrion-eating reptiles.

Fortunately, once on the ship, we found no difficulty in transferring them by attracting them from the darkened trap into the sunlit cage and quickly shutting the door between.

After this first capture, we established the trap near the beach where the lizards were being drawn by the lure of a putrefying dead pig which we had placed just out of their reach in a tree. The attraction of the bait seemed to be increased by laying trails of linseed oil, and after this we were able to catch dragons as fast as we could make cages in which to keep them.

Since the trapping was well established, I was glad to be able to spend my time procuring a series of pictures. Near the rock where the trap had previously stood, we tied up a dead goat and prepared a cover of green canvas and branches, from behind which I could watch and photograph the reptiles without being seen by them (opposite page).

First of all, I found that dragon lizards love the sun. They would not emerge from their lairs before the sun was high in the heavens. Perspiration fairly poured off me.

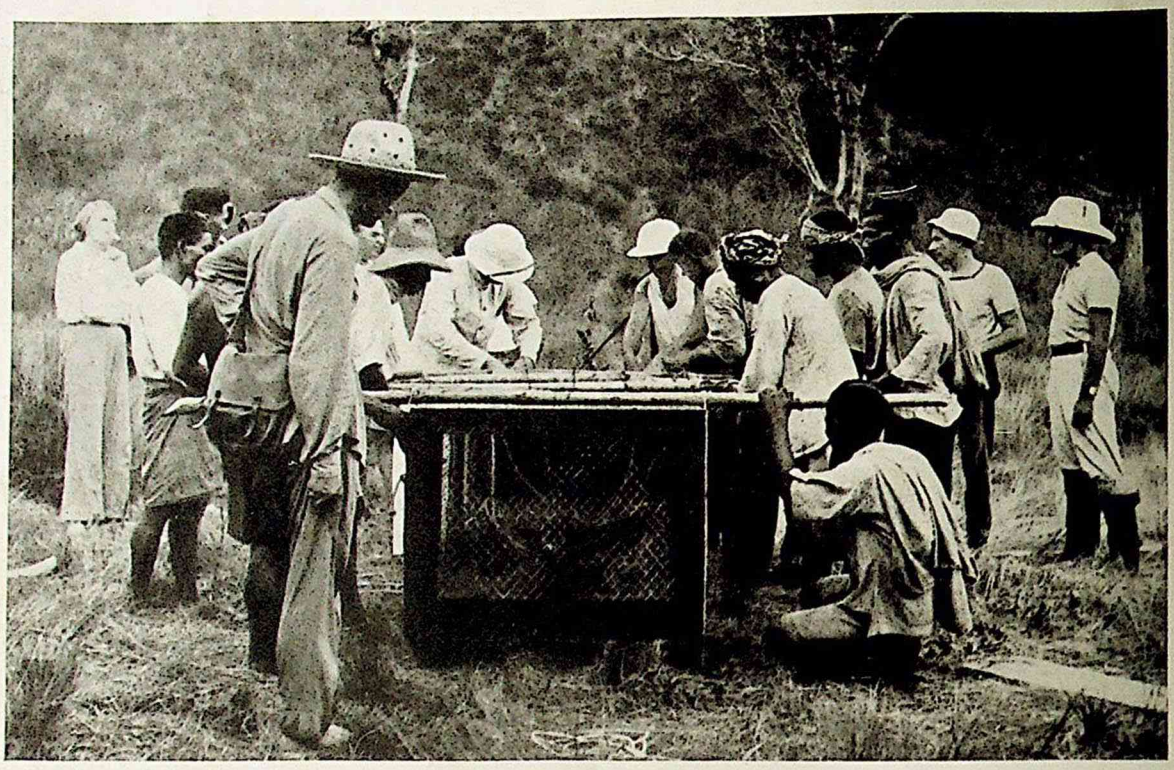
The first day the lizards were suspicious



© Lady Broughton

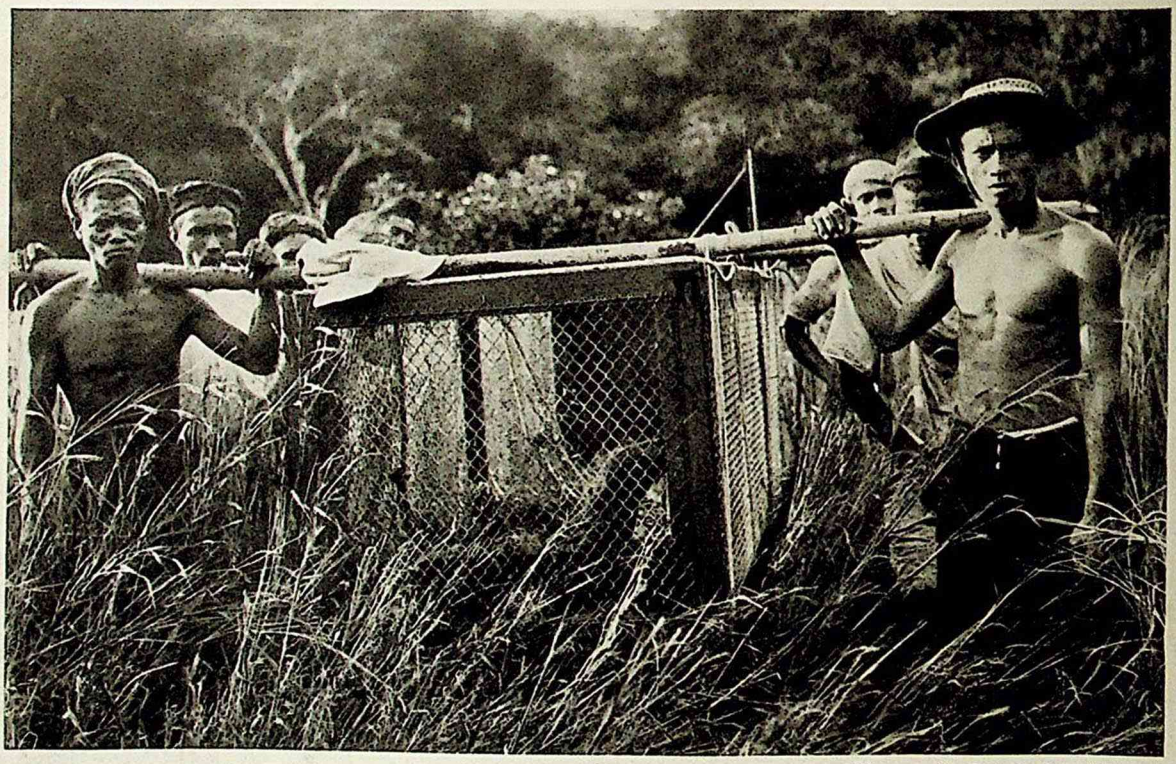
THE EXPLORING PHOTOGRAPHER PEERS FROM HER BLIND, READY TO "SHOOT" GIANT LIZARDS

All day she waited here in sweltering heat before the ferocious but wary saurians approached a dead goat placed near by as bait (opposite page). Sportswoman and big-game photographer, Lady Broughton landed with a yachting party on the remote island of Komodo, Netherlands Indies, to capture specimens of *Varanus komodoensis* for the London Zoo. Largest lizards in existence, the carnivorous "dragons" were unknown to scientists until 1912.



STRONG WIRE NETTING CONFINES A RAGING MONSTER

While carrying poles are being attached, the dragon claws the sides and lashes with its tail, trying to break out. Lured by putrid deer or boar meat in the trap, the lizard entered cautiously and was automatically imprisoned by a heavy door.



Photographs © Lady Broughton

THE TRAP BECOMES A SEDAN CHAIR FOR CARRYING A LIZARD TO THE YACHT

Lady Broughton's party caught seven of the reptiles, but since the official limit was three, they released the smaller specimens. At sea, one of the captives burst its cage and jumped overboard (page 331).



DRAGONS' APPETITES ARE RAVENOUS AND THEIR TABLE MANNERS ATROCIOUS

This brute rips chunks from the carrion bait, near the blind (page 323). Its huge red mouth, lined with sharp saw-edged teeth, can gulp the whole hindquarters of a boar, bones and all. When excited, the lizards disgorge their food.



Photographs © Lady Broughton

"STOP, LOOK, AND SMELL!" IS THE DRAGON LIZARDS' MOTTO

They may even rear up on their hind legs to see if the coast is clear before tackling the bait. Though keen of sight and scent, they seem deaf and were not disturbed when a shotgun was fired a few yards away.



© Lady Broughton

HERE MIGHT BE A SCENE FROM THE EOCENE EPOCH, WHEN THE ANCESTOR OF THE KOMODO DRAGON FIRST APPEARED

Sixty million years, more or less, have made little change in these oldest of lizards. Puzzling to scientists is the question of how they happen to live on Komodo, formed in comparatively recent geologic times. They are found only on this island and a few neighboring ones in the Lesser Sunda group, between Java and Timor. Fourteen specimens, two alive, were brought to the United States in 1926 by the Douglas Burden Expedition. The exiles soon died, but a mounted group is on exhibition at the American Museum of Natural History in New York. The specimen at the National Zoological Park in Washington, D. C., died this summer.



© Lady Broughton

HISSING AT EACH OTHER, A BELLIGERENT PAIR DISPUTES A PIECE OF BAIT

A low sibilant sound is the only noise dragons make. Surprisingly agile for their bulk, they sometimes weigh 250 pounds and reach a length of about 12 feet. At night they hide in wide caverns excavated by the powerful five-clawed feet. Giant lizards like these may have been the source of the dragon of oriental mythology, a favorite design in Chinese art. The fabulous animal was the imperial badge; the ruler was called the "Dragon Emperor" and his throne the "Dragon's Seat."



© Lady Broughton

LIZARD TRAPS WERE SET IN THESE FOOTHILLS, WHICH OVERLOOK A QUIET BAY

Dragons roam from the volcanic island's jagged mountain tops down to its sandy beaches. Komodo, 22 miles long by 12 miles wide, was uninhabited till a few years ago, when the Raja of Soembawa established a convict settlement here. Wild boar, deer, water buffalo, game birds, and venomous reptiles such as cobras and vipers are plentiful. Existence of the dragon lizards was first reported by pearl fishermen to a Netherlands scientist in Java.



A TRAILING TAIL LEAVES ITS WAVY TRACK BETWEEN A DRAGON'S FOOTPRINTS

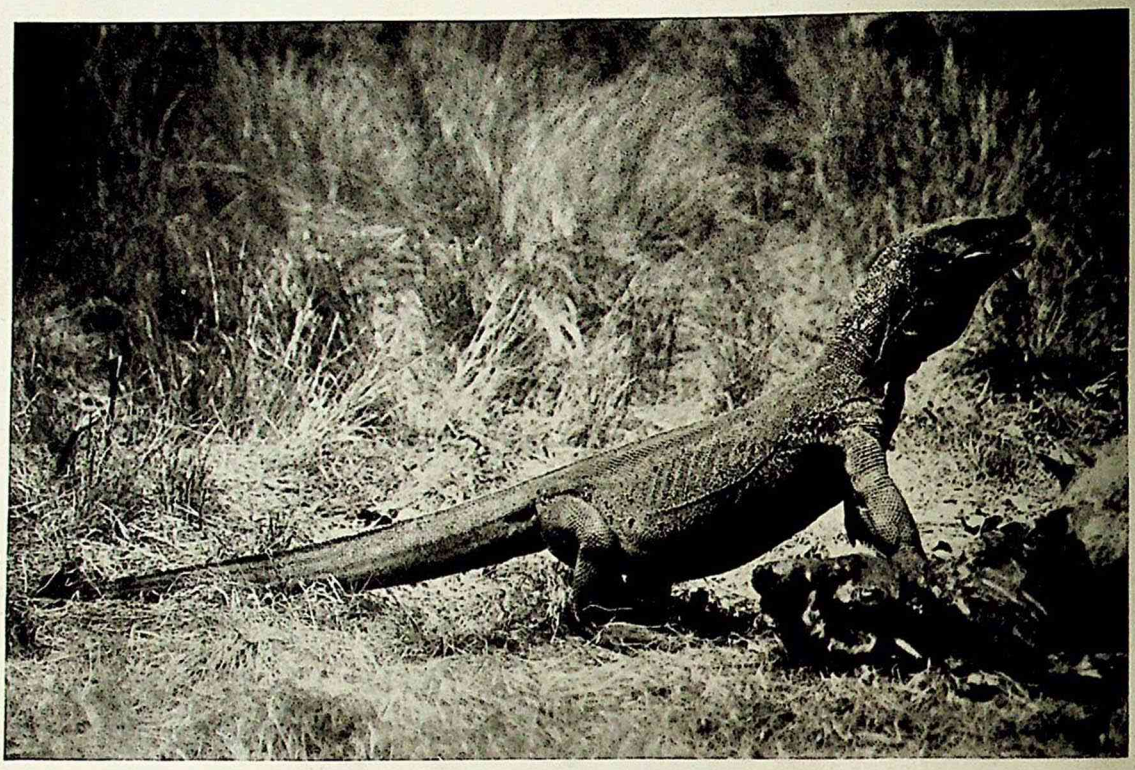
In this way, prehistoric reptiles stamped their imprints in mud, which hardened and thus preserved the fossil records that scientists study today.



Photographs © Lady Broughton

SURPRISE PACKAGE! A LIVE YOUNG DRAGON IS PRESENTED TO THE EXPEDITION

The gay-shirted gift bearer caught the lizard with a noose and wrapped it in rushes for safekeeping; but the long tail dangles freely.



A DRAGON AT THE KILL

The distended throat shows that the lizard has just gulped a big piece of meat. Dull-colored scales are small, but under each is a bony plate of armor that makes the monster invincible among its neighbors.



Photographs © Lady Broughton

A YELLOW FORKED TONGUE DARTS NERVOUSLY LIKE A SNAKE'S

Dragons of legend are often pictured with just such bifurcated, or two-forked, tongues. A lizard's heavy tail usually drags on the ground, but sometimes is carried aloft, the tapering end turned upward like a dog's.

and no large ones came down to my bait, though several watched all day at what they considered a safe distance.

Every now and then I could spy a big head raised out of the long grass, and once or twice a dragon would come crawling down almost into the cleared space which I had carefully prepared for photography. But always at the last minute they would lose courage and make off to cover before I could get a satisfactory picture.

However, the second day things were different. The goat carcass, by this time so nauseous to me, acted as a charm for them. The small dragons became fearless and seldom was the carcass without one gnawing at it. The big dragons, throwing all caution to the winds, rushed down with surprising agility and speed, tearing and dragging large pieces of the meat away from the carcass to be eaten at leisure out of sight in the long grass.

That dragon lizards have a keen sense of smell I had ample occasion to observe. In the valley where I watched them the wind was continually changing, and they used to pick up my scent at once even when they had their heads to leeward of the overpowering stench of the carrion. In an instant all of them would take fright and disappear.

All the time I kept myself carefully hidden from their sight, but, as other observers had reported that these lizards are stone-deaf, I did not trouble to keep quiet.

UNDISTURBED BY A SHOTGUN'S ROAR

In fact, wishing to test this theory of deafness, I discharged a shotgun over their heads at a range of a dozen yards on more than one occasion. Neither this nor the rattling of plateholders nor the human voice seemed to make any impression on them, whereas they would notice any movement in an instant and make off.

That they are deaf to some sounds seems beyond dispute, but it is interesting to note that the specimens at the zoo very definitely hear the sound of the key turning in the lock of their cage. When the keeper goes to feed them, their attention is immediately arrested by this sound.

The baby dragons were highly inquisitive. One, measuring about three to four feet, came through my covering hedge of branches and sat staring at me at an arm's length for some time. Another climbed a tree close by and, stretching itself along a branch, lay watching me for many hours.

Dragon lizards appear to make no sound other than a low hissing at each other when in competition for the meat spoils. When drawn to a carcass by the powerful odor, they seem to be almost licking their lips in anticipation, owing to their curious habit of shooting in and out their long forked tongues.

REPTILES NEVER VENTURED TO ATTACK

In their wild state they are said to be dangerous, but I cannot support this statement. I spent days watching, at close range, dragons of all sizes up to about twelve feet in length. I had no protection other than the small hedge of cut branches and leaves. At no time did the creatures show any signs of attacking me.

It is difficult to say how many dragons I saw, but they are undoubtedly very numerous on Komodo. I have a few feet of cinema showing four large ones on the carcass at the same time, and many photographs showing three.

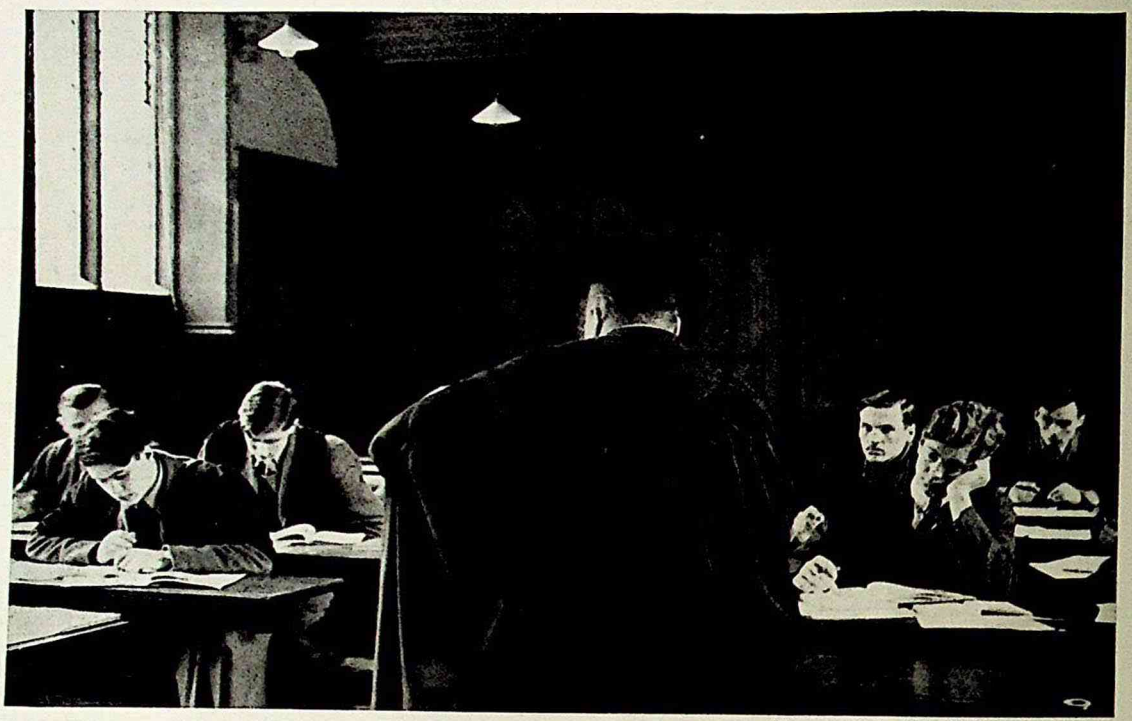
We had no opportunity of seeing the reptiles killing or eating their natural food. Our only evidence as to their ordinary diet was obtained when one, which had been caught in a trap, in its excitement regurgitated first the chunks of rotten meat it had swallowed and then a large unbroken turtle egg.

Wild pigs and deer are plentiful on Komodo, and we had no reason to doubt the report that the dragon lizards catch the small ones.

The natives would not go near the haunts of the dragons after dark and seemed in considerable fear of them even in daylight.

For the homeward journey we put our specimens in strong crates with beveled slats on one face. Unfortunately, our carpenter sought to lighten the lids by inserting a panel of wire netting.

When the yacht was some days out on the homeward journey, one of the dragons burst its way through the netting, and, as no trace of it was ever found on the ship, presumably it jumped overboard. The other two were safely delivered to the zoo and, in addition, our cameras had captured numerous others that are still free to partake of their odoriferous banquets on the hills and beaches of Komodo.



Photograph by Alfred Eisenstaedt-Pix

IN THE THROES OF EDUCATION! A STUDY IN CONCENTRATION AT KING'S COLLEGE

The don lectures in academic dress; undergraduates wear dark gowns, frequently tattered (p. 334).



Photograph from General Photographic Agency, Ltd.

A GIRTON COLLEGE "UNDERGRADUETTE" CHATS WITH HER TUTOR

Cambridge has two colleges for women, established more than sixty years ago (opposite page).

WITHIN THE HALLS OF CAMBRIDGE

By Philip Broad

MULTITUDES of American college men, old and young, find odd contrasts between university life in the United States and that of ancient Cambridge, where I took my degree. These differences are plain in discipline, in daily life, in the relations between faculty and undergraduates (never "students" at Cambridge), and in certain customs peculiar to this venerable seat of learning.

When I left the train at Cambridge, after a short but tedious ride from London, there was little about the dingy railroad station to suggest that somewhere hereabouts stood a great university town.

Nor did the policeman of whom I asked my way to "The University" offer any help; he couldn't, simply because there are so many colleges here, each in itself a little university. However, after driving into town along a wide thoroughfare which my taxi man told me had been in ancient times a highway used by Roman soldiers, I finally arrived at St. John's College which I was to enter.

JOHN HARVARD'S ALMA MATER

Because John Harvard, principal founder of the famous American center of learning which bears his name, was educated at Cambridge, this university holds a special interest for people in the United States.

John Harvard entered Emmanuel College in 1627. In an old leather book there you see his signature, and a notation that he paid a ten-shilling matriculation fee.

Now a tablet is set up in the Chapel at Emmanuel to his memory; and this year Cambridge in England observes with sympathetic interest the movement in Cambridge, Massachusetts, to celebrate the 300th anniversary of the founding of Harvard College (page 334).

Each Cambridge college is a separate entity. Each has its own chapel, lecture rooms and assembly hall, but most of the space is devoted to residential quarters.

This independence has been characteristic of Cambridge from its earliest days. It dates from the foundations established by religious orders, such as the Dominicans and the Carmelites, most of which belong to the first part of the 13th century. It continued with the foundation of the colleges, the first of which was Peterhouse, established in 1284. The majority of the others followed in the 14th, 15th, and 16th centuries, though Selwyn was founded as recently as 1882.

Cambridge long held out against the admission of women students, and, though it was obliged at last to surrender and welcome the two girls' colleges, Newnham and Girton, more than sixty years ago, it still, unlike Oxford, does not allow women to take actual degrees.*

"UNDERGRADUETTES" INSTEAD OF COEDS

The "undergraduettes" attend lectures, both university and college, with the undergraduates, and take the same "honors" examinations (they are not allowed to take the easier "pass" examinations), but if successful their reward is merely a "title to a degree" (pages 332, 335, and 337).

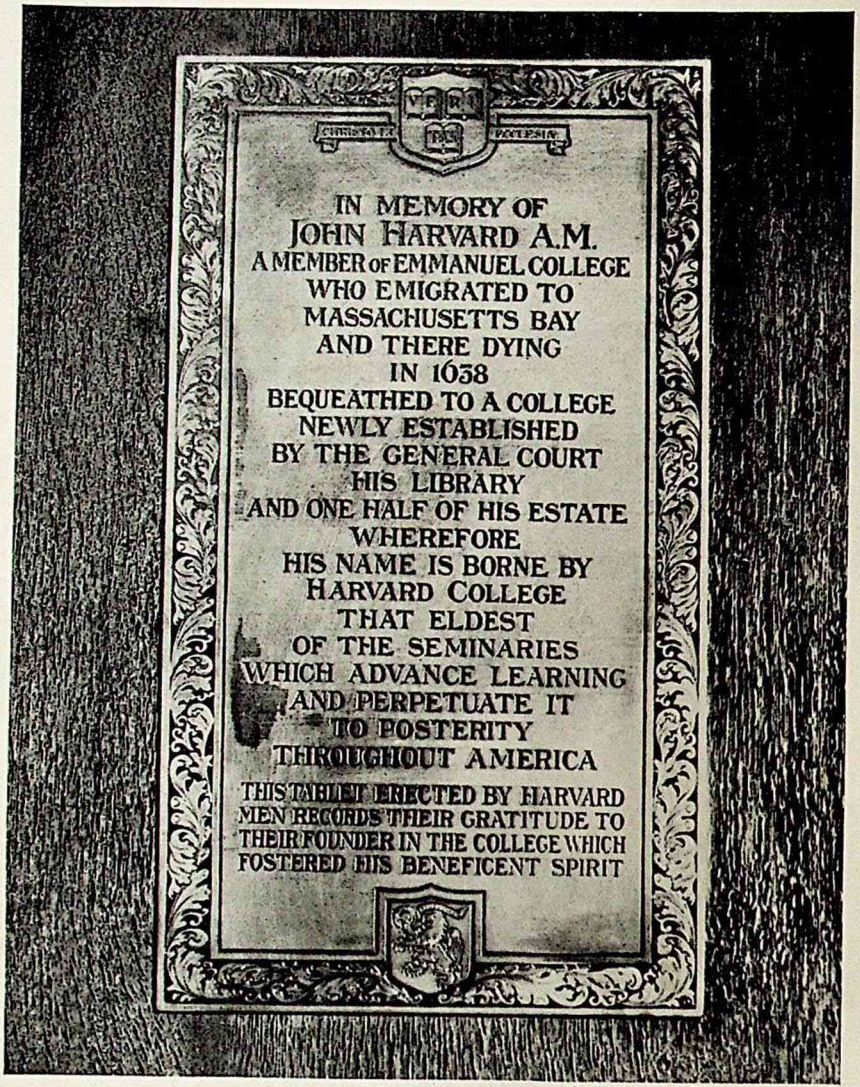
Every college has its own staff of tutors and its own endowments which, together with the fees from its student members, provide for its upkeep. In many cases the colleges have acquired much landed property.

From the beginning it was impressed on me that the loyalty of the individual is first to his college. It is by no means uncommon for the members of a family to send their sons to one particular college, generation after generation. But in the background there always remains the Alma Mater, the University itself. To the initiated it is my college that I mention first; to the stranger, if asked, I announce myself as a Cambridge man.

The University, like a college, is a corporate body with its own endowments supplemented by contributions from the colleges and the Government. It also has its own lecture halls and research laboratories and it alone appoints the professors, who are the elite among the "dons," or faculty members.

While the ultimate governing authority is the Senate, which consists of those who have taken the degree of Master of Arts, the executive authority is vested in the Chancellor, elected by the Senate, who is now always a prominent national figure. The office at present is held by Prime Min-

* See "Oxford, Mother of Anglo-Saxon Learning," by E. John Long, National Geographic Magazine, November, 1929.



Photograph by Clifton Adams

TO HARVARD'S PRINCIPAL FOUNDER IS DEDICATED THIS TABLET IN HIS ALMA MATER'S CHAPEL

At Emmanuel College, where John Harvard studied, a suite of rooms named in his honor is occupied each year by a student from the famed American university that bears his name (page 333). Another Harvard memorial is his mother's old home in Stratford-on-Avon.

ister Stanley Baldwin. In practice, however, his duties are performed by the resident Vice Chancellor, who is invariably the head of one of the colleges.

TATTERED GOWNS FASHIONABLE

This division of the University's life into colleges is seen in the differences in the gowns, which all undergraduates must possess. These are curiously abbreviated garments, a survival of the clerks' uniform of the Middle Ages; but the forms of each college have distinctive features, such as the three small velvet chevrons on the sleeves of those of St. John's.

Normally the gowns are black, but those of Caius (pronounced "Keys") are blue with black facings, those of Trinity a darker blue. They, and their accompanying square mortarboard caps, are often in the most decrepit state, since a tattered gown or a crushed cap is regarded as a sign of seniority; hence, "freshers," as the first-year undergraduates are called, frequently indulge in an orgy of near-destruction to acquire this outward mark of seniority. I must admit from experience that this procedure can prove expensive. It may involve the purchase of an entire new outfit to secure the approval of outraged authority.

Gowns are worn when attending lectures, or when dining in college hall, which is the one occasion when the members of a college meet together a certain number of nights each week, whether they wish to or not.

Gowns must also be worn on the streets after dusk, and woe betide the unfortunate undergraduate who encounters a proctor when not in this garb. It is an equally heinous sin if he be found smoking in the streets, even when he is properly attired. These are two of the offenses against the dignity of the University for which the

proctors, who have charge of University discipline, are on the lookout.

IN THE TOILS OF THE PROCTOR

A proctor, to the undergraduate, is an impressive and fear-inspiring being, not only because of the moral weight of the authority behind him but also because he is always supported by two "bulldogs" or "bullers." These robust college porters, in spite of silk hats and formal black suits which they are obliged to wear, are often surprisingly agile in their pursuit of a delinquent undergraduate — as I learned by dire experience. But when a capture is effected, proper formalities must be observed.

"Sir," said the buller, polite but puffing, "the Proctor would like to speak to you for a moment."

And when I was brought before the majesty of authority, the conversation was equally courteous.

"Sir, I regret to see that you are not properly dressed; I should be glad if you would call on me in the morning."

My name was noted in a book, and when in a spirit of due repentance the visit was made the next day, six shillings and eightpence was the fine (about $1.70). Had I been a Bachelor of Arts it would have been double this sum, for surely years of discretion, accompanied by the right to wear a longer gown and a proper tassel on the cap, must be expected to bring a proper respect for the laws of the University. Offenses committed on Sunday also involve a double penalty. No offender escapes. It is on record that King Edward's brother, the Duke of York, smoked what was probably the most expensive cigarette of his life during his undergraduate days at Cambridge.



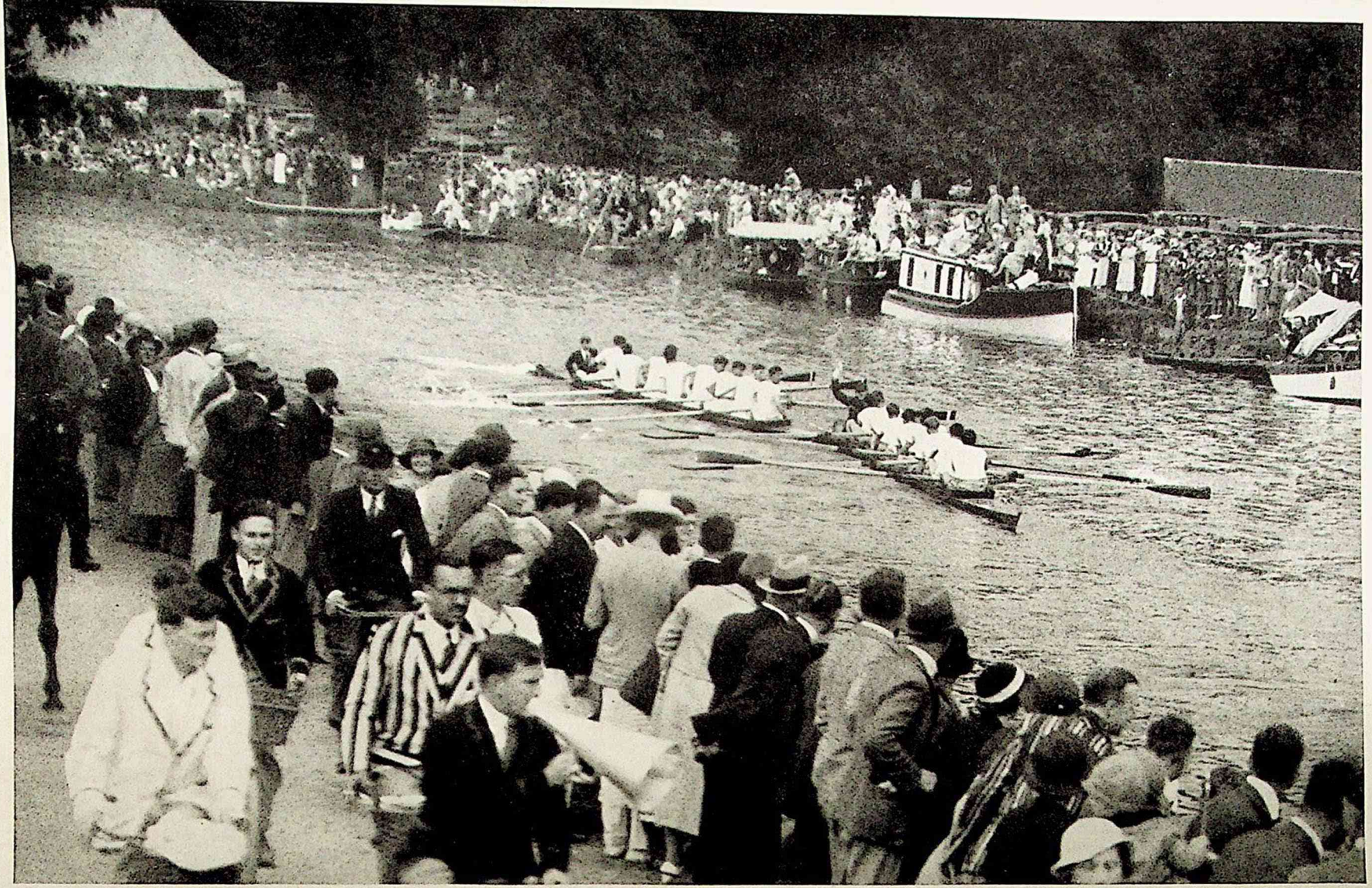
© Paul Popper from European

EVEN CRICKET IS NO LONGER A MALE MONOPOLY AT CAMBRIDGE

The wind-blown player in white helps the next batsman don her gloves, while sister undergraduates of Newnham College watch from the sidelines. Both girls wear pads on their legs as protection against swift balls.

"BLUES" AND "HALF-BLUES"

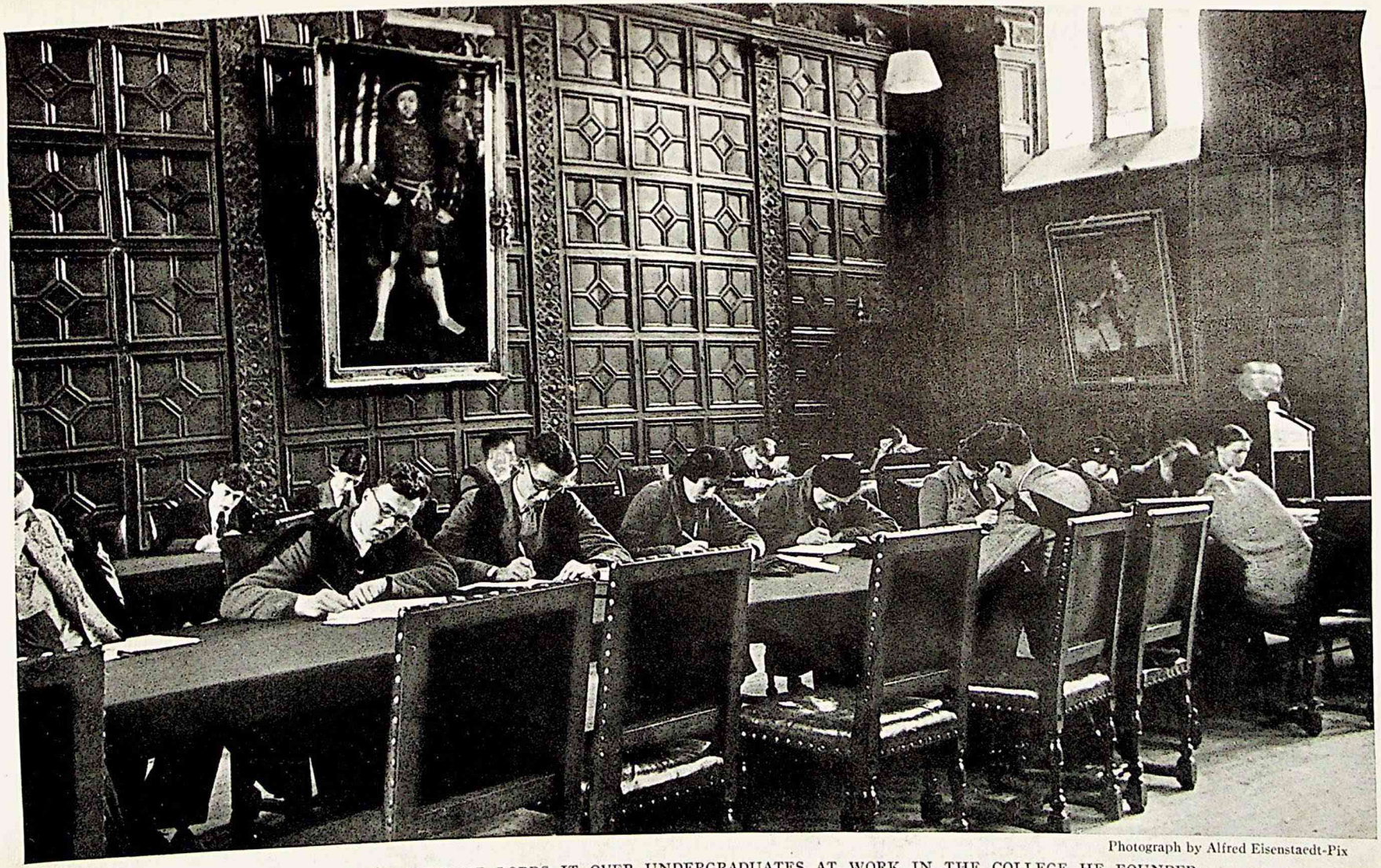
Friendly rivalry among the colleges is shown in the wide variety of sports jackets, or "blazers" (Plate I). They appear in all colors and combinations of colors, and may



© Cambridge Daily News

A "BUMP"! THE BOAT ON THE LEFT WINS A "MAY WEEK" RACE BY OVERTAKING THE SHELL AHEAD

The coxswain's upraised hand quickly acknowledges defeat; otherwise the victor's sharp prow might injure someone. Starting 150 feet apart, each boat tries to bump the one in front and thus gain the latter's position for the next day's contest. Coaches and undergraduates cycle along the bank, shouting to their crews (p. 338).



Photograph by Alfred Eisenstaedt-Pix

BLUFF KING HAL'S PORTRAIT LORDS IT OVER UNDERGRADUATES AT WORK IN THE COLLEGE HE FOUNDED

Henry VIII would probably be astounded to find women being examined side by side with men in the paneled hall of Trinity (Color Plate I). The girls, though not members of this college, may use its facilities for research. Trinity men wear gowns of dark blue, instead of black as at King's (page 332). Unlike most American universities, Cambridge requires students to be inside their college gates after 10 p. m.; late-comers must pay a small fine.

denote not only membership in some particular college but also some athletic achievement, such as membership in the cricket eleven or the Rugby football team.

Most coveted is the pale blue blazer which only those who have represented the University in athletics are entitled to wear. For the remainder of their lives these fortunate ones will be remembered as Cambridge "blues." There are "half-blues" for the less arduous sports, such as shooting or even chess!

"Blazers" owe their very name to Cambridge, for this was the term quite naturally applied to the scarlet coats which the Lady Margaret Boat Club, of St. John's College, adopted as its uniform.

Sports in general hold a high place in life at Cambridge. Rugby and Association football—known as "rugger" and "soccer"—are popular in the winter, while in summer cricket and tennis take their turn. But the sport of sports at Cambridge is rowing (page 336).

The races are rowed on a section of the River Cam below the actual town. The stream is so narrow even there that it is impossible to row abreast, so here, as at Oxford, a system of "bumping" races has developed.

From the spectators' point of view this is perhaps an advantage, for they can watch the spectacle of a straining procession of eight-oared boats chasing each other at intervals of 150 feet. Some "bumps" are mere touches; others are really violent blows. I well remember rowing in a boat which was hit so hard it sank outright in the middle of the river, whereupon our discomfited crew had to swim and wade ashore as best they could.

"THROWING AWAY A RACE"

There is also the well-known Cambridge rowing story, perhaps apocryphal, of the excited coxswain who almost literally "threw away a race."

The atmosphere was electric. Eight oars were poised, ready to be dipped like a flash at the boom of the gun; eight pairs of eyes were concentrated on the coxswain who was counting feverishly the seconds before the start. In his left hand he held the stop watch; in his right the wooden bobbin of the spacing chain which keeps each boat at its correct distance from the others.

The great moment arrived, the shot echoed across the river, and with a dramatic gesture he cast the watch into the water and clung to the anchored chain. Need I add that his boat failed to score a bump that day?

The last day of the races is celebrated by "bump suppers" in each college, ending often in a wild dance around a huge bonfire in the grounds of the college that has won, or kept the "Head of the River." Four bumps entitle a man to keep his oar as a trophy.

I would not recommend for weak digestions the breakfasts found necessary in the strenuous training for both the Lent and May Week races. They are no mild meals of grapefruit and coffee, but, starting with fish and bacon and eggs, they continue with large portions of rare steak. The toast and marmalade that followed was often difficult to face.

The "May" races are the principal event, coming as they do after the examinations at the end of the scholastic year when all Cambridge goes gay and celebrates a social season of its own. Both banks of the river offer then a bright picture. They are crowded with friends and relatives of the crews and the whole scene is animated by undergraduates in bright blazers cycling or running along the tow-path to shout encouragement to the boats of their colleges (page 336).

Automobiles are forbidden to undergraduates in their first year, and this is a blessing to those who do own cars, since the narrow streets of the town are already crowded by innumerable bicycles.

I soon found that this was the most convenient form of transport to and from lectures. Indeed, the popularity of individual lectures can be accurately gauged at a glance by the number of bicycles parked outside. The absence of hills makes this a cyclist's paradise. Cambridge in no place rises more than fifty feet above sea-level, and even the oddly-named Gog and Magog outside the town hardly deserve the name of hills.*

From time to time the monotony of study is relieved by "rags" organized by the undergraduates.

The fun is usually harmless, and entered into in good spirits by participants and onlookers alike. I recall one night when field guns awarded to Jesus College as

* See "A Tour in the English Fenland," by Christopher Marlowe, NATIONAL GEOGRAPHIC MAGAZINE, May, 1929.



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FOUNDED BY HENRY VIII, TRINITY IS CAMBRIDGE UNIVERSITY'S LARGEST COLLEGE

Among its famous sons was Sir Isaac Newton, who had an observatory atop the Great Gate (above). To the left of the portal roomed Thackeray and Macaulay. Like Oxford, Cambridge consists of about a score of colleges. Two are for women. For more than seven centuries this university, 50 miles north of London, has been a center of learning. The undergraduate near the geranium-bordered fountain, in Trinity's Great Court, wears the blazer of the Corpus Christi College rowing crew.

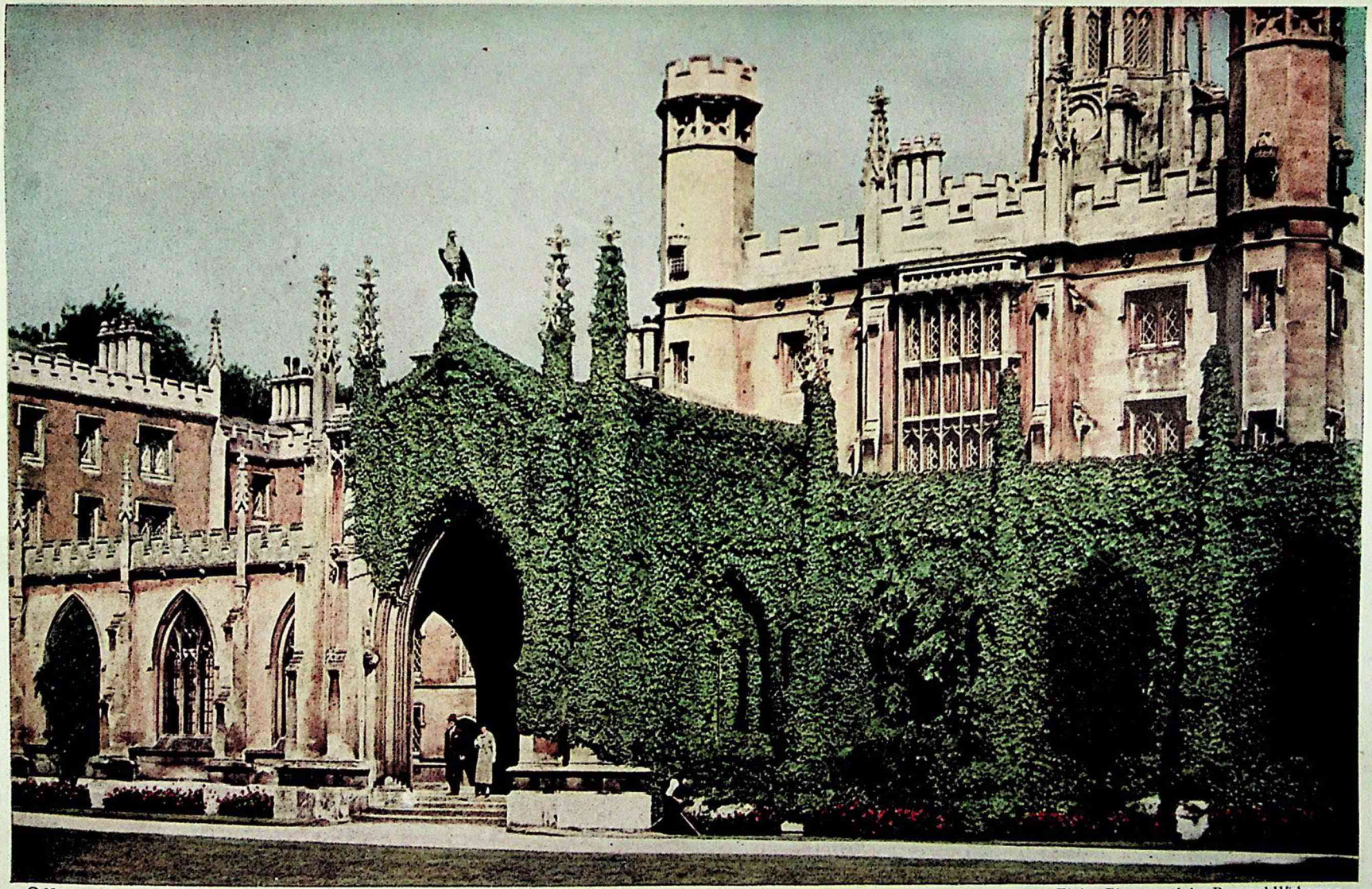


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Finlay Photograph by Bernard Wakeman

"SMOOTH CAM'S SILENT WATERS" REFLECT A GOLDEN WILLOW TREE BEFORE PALACELIKE CLARE COLLEGE

Distinctive of Cambridge are the tree-shaded lawns and gardens, particularly the spacious "backs" across the river from the college buildings. The River Cam, oddly enough, is named for the town. Cambridge has a special interest for Americans. Alumni who came to the New World as colonists christened Cambridge, Massachusetts, in honor of their alma mater; and our oldest university was named for a Cambridge graduate, John Harvard.

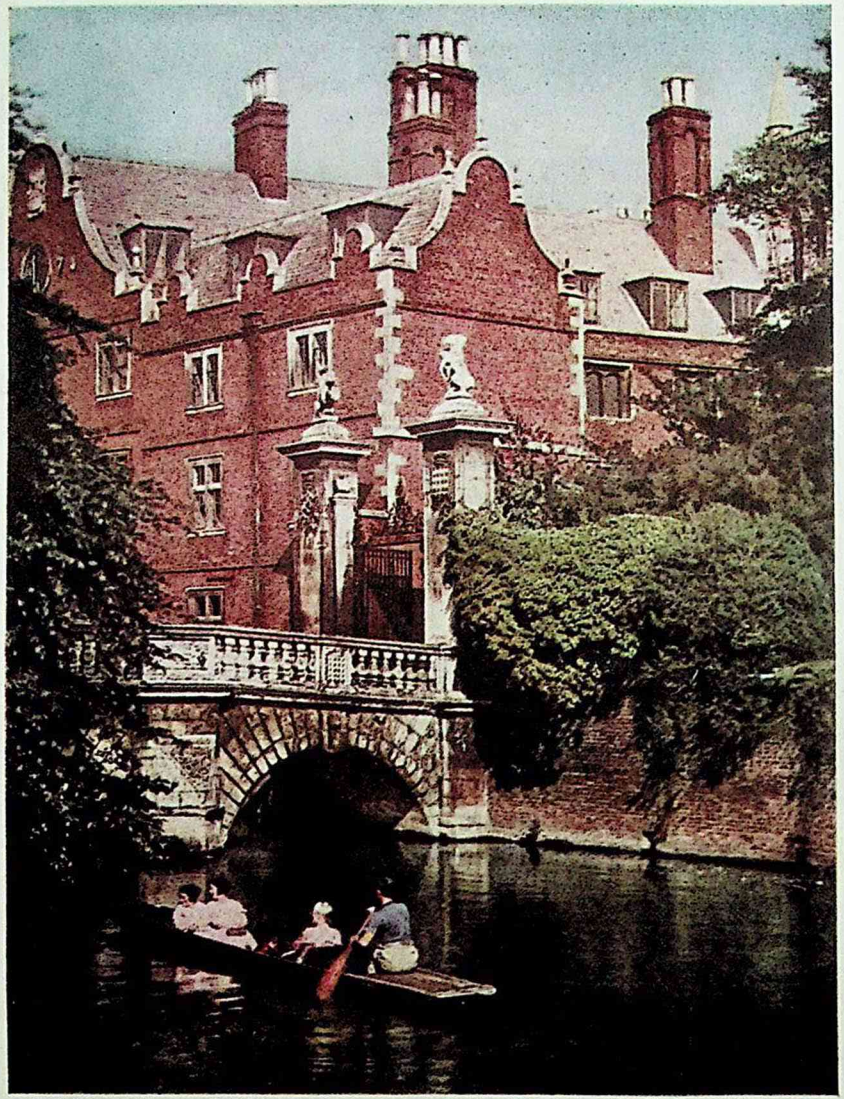


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Finlay Photograph by Bernard Wakeman

WILLIAM WORDSWORTH USED TO WANDER IN THE "BACKS" WHERE NOW STANDS ST. JOHN'S NEW COURT

The poet describes undergraduate life of 150 years ago: "We sauntered, played, or rioted; we talked unprofitable talk at morning hours; drifted about along the streets and walks, read lazily in trivial books." New Court, with its ivy-clad cloisters, stands in the "backs" on the Cam's west bank. Cambridge University has more than 5,000 students. Most live in colleges, but many take lodgings in town during their three-year course.



© National Geographic Society Finlay Photograph by Bernard Wakeman

A FAVORITE VISTA ON THE CAM—ST. JOHN'S OLD BRIDGE

Paddling under its graceful arches, boating parties look downstream toward the "Bridge of Sighs," which leads to New Court (Plate III). Each college has its own dining hall, and numerous servants known as "gyps." Students may attend lectures at other colleges besides their own.



Finlay Photograph by Walter M. Edwards

"DON" AND STUDENT CHAT BENEATH QUEENS' OLD SUNDIAL

The tutor wears shorts, the undergraduate a rowing blazer. At chapel, lectures, dinner, and other stated times, the traditional square caps and black or blue gowns are the undergraduate dress. Formerly the chapel for Queens' College, this mellow brick building is now a lecture hall.

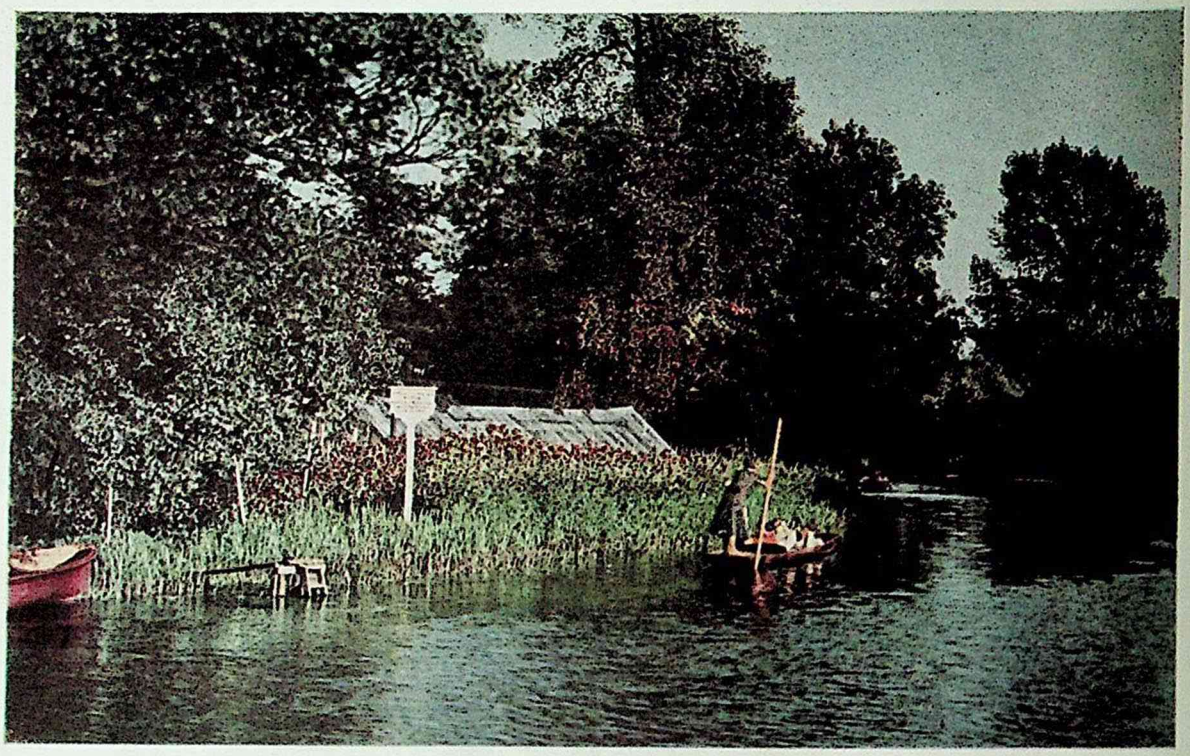


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Finlay Photograph by Bernard Wakeman

MILL PONDS OF GRANTCHESTER WERE "OLD SWIMMING HOLES" FOR CAMBRIDGE MEN

At Byron's Pool, near here, the poet often bathed during his undergraduate days at Trinity College. About a century later Rupert Brooke, a young poet casualty of the World War, lived not far from these old houses and later sang the hamlet's praises in "Grantchester," one of his finest poems. When it was proposed to build an express highway across the pastoral meadows between Cambridge and Grantchester a few years ago, an American trust fund purchased the construction rights and thus preserved the rural retreat.



A BAREFOOT GIRL PUNTS PICNICKERS UP THE CAM TO BATHING PLACES NEAR GRANTCHESTER

The trick in punting is not to get left behind clinging to your pole when it sticks in the mud! Cambridgeshire has numerous fens or marshes where skating races are held in winter.



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Finlay Photographs by Bernard Wakeman

ONCE A CONVENT, JESUS COLLEGE PRESERVES ORIGINAL MONASTIC BUILDINGS

The Priory of St. Radegund was already more than 300 years old when the Bishop of Ely suppressed it in 1496 and replaced nuns with students. Thomas Cranmer, famed Archbishop of Canterbury, entered college here at the age of 14.



COTTAGES WITH THICKLY THATCHED DORMER WINDOWS SUGGEST PRIM OLD LADIES IN POKE BONNETS

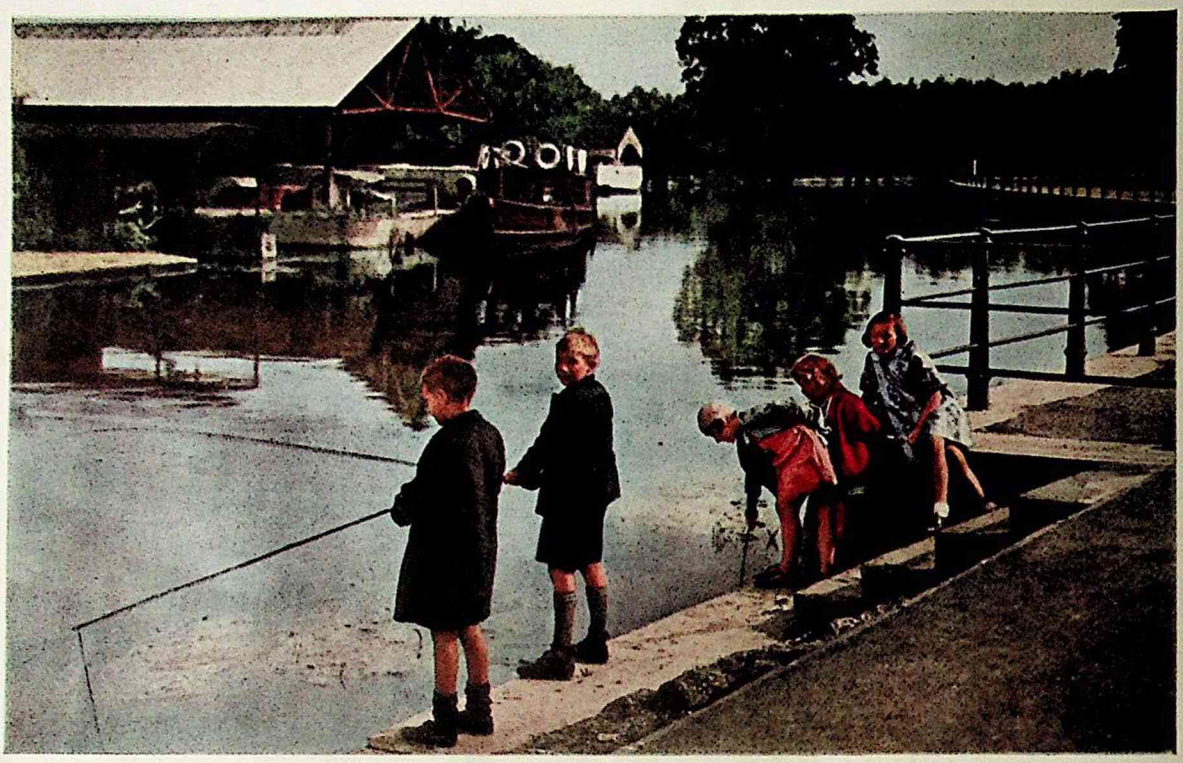
Green gas lamps are still used on "Main Street" in Trumpington, about two miles south of Cambridge on the London road. A sign near the scarlet truck proclaims an inn, the Coach and Horses.



© National Geographic Society Finlay Photographs by Bernard Wakeman

THESE VILLAGERS "ROUGED" THEIR HOUSE WITH RED OCHRE

Shepherds sometimes mark their sheep with this brilliant pigment, which countryfolk call "raddle" or "ruddle." Green trimmings and blue window curtains heighten the colorful effect of this cottage at Bottisham, about six miles northeast of Cambridge.



ANGLING THE CAM IS GOOD FUN, THOUGH THE FISH ARE FEW AND TINY

The river has lost its former commercial importance, but it is a joy to schoolchildren, boatmen, and picnickers. Flowing northeastward to join the Ouse, it provides a direct waterway to the North Sea.



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Finlay Photographs by Bernard Wakeman

IN CAMBRIDGE, EVEN A PROSAIC LOCK IS DRESSED UP WITH A GAY FLOWER BED

Like many other small English rivers, the Cam is made navigable by a series of locks. Above here the stream flows between colleges and "backs." Below is the long stretch devoted to rowing. The chief boat races are held during "May Week," which is actually in June!

trophies of the World War were stealthily removed and hidden. Another "rag" was a mock naval battle in which a tug, skillfully disguised as a warship and navigated with some difficulty up the shallow river, was attacked by fleets of smaller craft, the engagement ending in general duckings in the stream.

Then there was the club whose members calmly sat out in the street before King's to the entire dislocation of traffic; and the unveiling of Tutankhamen in the Market Square (a favorite scene for "rags"). The proctors, of course, were much in evidence on these occasions, but they were not resented, and the ever-patient Cambridge police, known affectionately as "Roberts," looked on with their usual tactful tolerance.

"MAY WEEK" COMES IN JUNE

"May Week," which, paradoxically enough, is always celebrated in June and lasts more than a week, sees a merry concentration of social activities.

Most popular among its parties are the famous college balls, where dancing, either on specially-laid floors in the halls or in huge marquees in the grounds, continues well into the morning. The culminating feature is a breakfast-time group photograph of the stalwart if somewhat white-faced dancers and their partners who have been strong enough to see the night through.

On these occasions the grounds, lit with lanterns, and the fleets of illuminated punts on the river present a fairylike spectacle among the silhouettes of the ancient buildings. It is a dangerous time for the sentimentally inclined.

May Week is a lighthearted period because by then most of the year's examinations are over. An examination for an "honors degree" is called a "tripos" because of the three-legged stool which was formerly used during ceremonies at degree time. For the less energetic undergraduates a "pass degree" is also provided.

DINNER JACKETS FOR MORNING WEAR

At the end of May Week comes the formal awarding of degrees, which takes place in the Senate House. It is also on the steps of this building that by ancient right graduates may entertain themselves with games of marbles!

For the graduation ceremony the candidates must dress themselves in a garb rather curious for the morning hour—a dinner jacket and dress shirt, over which is worn the shortly to be discarded undergraduate gown. Four at a time, a praelector leads in the candidates, each holding precariously to one of his fingers. A Latin formula is read, each candidate signs his name in full in a bulky volume, pays the appropriate fee in cash (no checks accepted!), and emerges as a full-grown Bachelor.

Immediately opposite the Senate House is the church of Great St. Mary's. Here the University sermon is preached each Sunday. I used to watch the Proctor, in cap and gown, on his way to attend this service, escorted on each side by his inevitable "bulldogs." Legend has it that an undergraduate may at his pleasure stop this procession and demand the reading of any chapter he may choose from the weighty Bible supposed to be carried by the Proctor or one of the attendants.

But the tale is told that on at least one occasion when this right was exercised the bag in which the Bible should have reposed proved empty! The Proctor himself once confessed that in plain fact his volume is not a Bible, but a mere collection of old statutes, one of which enjoins that no grammar be taught outside Jesus College.

"Why should Jesus College be condemned to the monopoly of this sad subject?" he enquired.

CHURCH BELL RINGS OUT THE DATE

Calendars are redundant in Cambridge, for each evening the bell in the tower of Great St. Mary's tolls out the date of the month.

The year at Cambridge is divided into three terms: Michaelmas, from early October to mid-December; Lent, from early January to the middle of March; and Easter, from the middle of April to the middle of June.

The undergraduate "goes up" at the beginning of the term, and "goes down" at the end; should he be the victim of serious disciplinary action, he is "sent down," to cool his heels for a term or so, or perhaps even never to be readmitted.

Every evening during term-time the great gateways of the colleges are closed punctually at ten. So are the doors of the many lodging-houses — called "digs" — in which most of the undergraduates live, for the growth of the University has made it impossible for more than about one-third to find rooms in the colleges.

After 10 p. m. no visitors are admitted. Residents arriving later must ring the bell, and have their names carefully entered in a book. Those who too often come home late face a punishment known as "gating," which means enforced confinement within college or boarding-house walls during evening hours.

To return after midnight is a much more serious offense. I must confess I used to find myself, in the company of other undergraduates, breathlessly running in an anxious attempt to obtain admittance before the fatal midnight stroke of the clocks.

Many are the devices resorted to by ingenious undergraduates to escape that unpleasant interview with their tutor, which they know is one price of being tardy. One such means of escape can be seen in the window above the left-hand gatepost of St. John's (Color Plate IV).

By tradition, the occupant of the room into which that window leads leaves it open, however cold the weather, "for fear of accidents." The undergraduate caught out after midnight, if sufficiently stout-hearted and acrobatic, may then get in unobserved by scrambling up the wrought-iron gateway and perilously leaning over the edge of the stonework until he can grasp the iron framework of this window.

ALPINE CLUB'S NOCTURNAL EXPLOITS

To the initiated, there are not many college buildings in Cambridge that cannot be quietly entered in some such manner when darkness has fallen. But the pitfalls are many.

Cambridge, though a city of the plain, had once an active Alpine Club, and many are the brave stories told of the nocturnal exploits of its members.

Not mountains, but steep roofs, were the objects of this Club's attacks. After all, they offer obstacles of a kind to challenge the courage of the most intrepid. Cambridge roofs, old and crumbling, are often no less precarious than Alpine slopes, and the old mountaineering device of roping is useful in scaling turrets, spires, and pinnacles. No "blues" have as yet been awarded to members of this Club!

The motto of the Club—"Though there's doorway behind thee and window before, go straight at the wall"—was printed in a solemn little illustrated guidebook, which cautioned members above all things to avoid disturbing the Dean.

The Dean is a redoubtable individual, responsible for the general discipline of each college. Although he is often a popular figure, he is the natural victim of practical jokes. Our own Dean once suffered the indignity of being photographed in his bed by flashlight by intrepid undergraduates. The expression on his face was worth all the trouble involved. Pursuit of the culprits was rendered impossible for him by the swift screwing up of the outer door to his rooms, the "oak" as it is called at Cambridge.

This "oak" is as solid as its name implies, and studious undergraduates, by "sporting their oak," or closing this door, announce to all and sundry their intention not to be disturbed.

"GYPS" AND "BEDDERS"

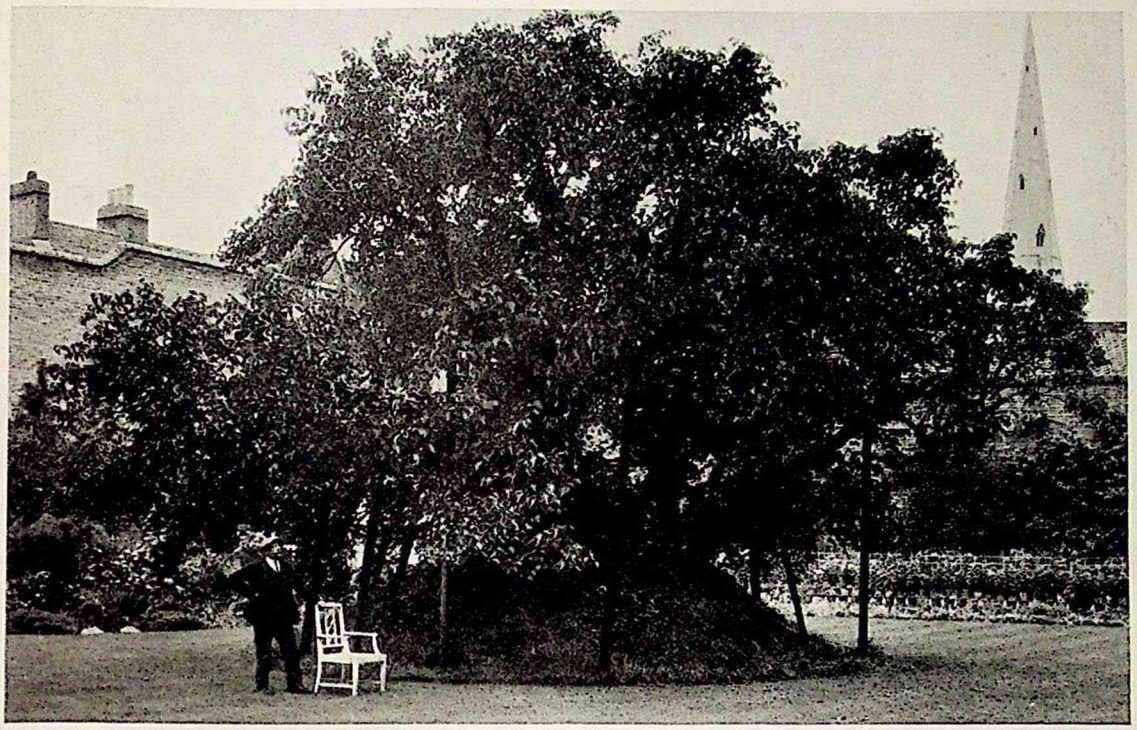
Usually each set of undergraduate rooms consists of a sitting-room, bedroom, and "gyp-room," or pantry. The latter is the happy hunting-ground of the "gyps" or "bedders," as the college servants are known; bedders are of the fair sex, though I fear that in appearance they do not always deserve this adjective.

I often took my meals in my own room, tea being a particular ceremony. For some reason, which I have never been able to fathom, it is quite out of the question to make use of the innocent instrument known as sugar-tongs; this is one of the most definite prohibitions laid down in the pamphlet of "Freshers' Don'ts," the guide which every new undergraduate is encouraged to purchase. Cups and saucers and the characteristic plates of toasted scones and cakes are by custom laid out upon the floor and each guest may help himself as he feels inclined.

FLOTILLAS OF BOATS SUGGEST VENICE

Looking out from the windows of my rooms in the New Court of St. John's, I had an almost Venetian view of the stream below. In summer this part of the river was crowded with the ever-popular punts, square-ended boats propelled with a long pole from a precarious standing position in the stern (Plates III and VI).

For the expert this is a graceful motion; but the novice may find his pole sticking, as I did, in the stiff mud of the river bottom! That may mean being jerked out of the punt, and thrown with a splash into the water.



Photograph by Clifton Adams

THE "MILTON MULBERRY" IS SOME THREE CENTURIES OLD

The author of "Paradise Lost" is supposed to have placed the tree in the gardens of Christ's College during his undergraduate days here; but, according to a more matter-of-fact account, it was planted in the very year of Milton's birth at the request of King James I, to encourage the silkworm industry.

Punting is popular on this section of the River Cam, which is too narrow and winding for the oarsmen; and its popularity is natural enough, for here the river traverses the famous "backs" which are perhaps the most beautiful feature of Cambridge (Color Plate II). Here are the many bridges, the spacious, well-groomed lawns, the rows of ancient elms, limes, and chestnuts about which so many poets have sung.

PUNTING TO GRANTCHESTER

This part of the river, by moonlight, holds infinite opportunities for romance. But punting is even more popular on the reaches of the river above the town, where the old name, "Granta," is still used in preference to "Cam."

Here one can gently wander in idyllic surroundings as far as Grantchester, which is near Byron's Pool (Plate V), and the meadows where Rupert Brooke tells us a man can lie and "flower-lulled in sleepy grass, hear the cool lapse of hours pass, until the centuries blend and blur in Grantchester. . . ."

The many poets whom Cambridge has produced may perhaps give the impression that the University does not concern itself with the more practical side of life. This is far from being the case, for wherever one goes Cambridge men are to be found occupying the highest positions of trust and importance.

Poets and princes, scientists and statesmen, law-givers, clergymen, and teachers—these and many more have studied here as old Cambridge has gone on through the centuries, molding the minds of men who helped make Britain great.



Photograph from Pictures, Inc.

FEET FLY IN A SOCCER MATCH AT ROME BETWEEN ITALY AND CZECHOSLOVAKIA

The player in the act of taking a tumble wears the Italian coat of arms. All Italy is becoming sport conscious, and both sexes engage in state-organized athletics (pages 363, 377, and 383).



Photograph from Wide World

"SONS OF THE WOLF" PARADE IN HONOR OF ITALY'S ENTRY INTO THE WORLD WAR

Children from six to eight are enrolled in this organization, which takes its name from the legendary she-wolf which suckled Romulus, traditional founder of Rome. The youngsters' white shoulder straps are fastened with a metal clasp in the form of Mussolini's initial. Women instructors will be replaced by men when the boys become Balillas (page 383).

SOJOURNING IN THE ITALY OF TODAY

By Mrs. Kenneth Roberts

NINE years ago we went to Italy to find a quiet and detached place in which my husband could write a series of American novels without interruption. We found it by remodeling a hilltop farm near Orbetello that was used by a relative as a summer home, but stood empty during the winter months.

We knew, from the chilblain cures exposed for sale in the local drugstore, that the hilltop was not a tropical retreat, but it held no terrors for people who had been born in, grown up with, and weathered successfully the rigorous winter climate of New England.

The house, a severely simple two-story rectangular farmhouse, stands on a hilltop four hundred and fifty feet above the water, facing the Tyrrhenian Sea, the Island of Elba, and the far-off island of Corsica. To the right, across the mouth of one of Italy's finest harbors, the mainland stretches away to Genoa and the north (map, page 353).

AN OLD WALLED TOWN BECOMES A MODERN SEAPLANE BASE

Orbetello is an old walled town surrounded by water on three sides. Today it is Italy's best-known naval aviation station. In our time it has grown from a few insignificant buildings and a few small seaplanes to many large barracks, officers' houses built in the modernistic manner, and a large flotilla of the most modern and fastest airships. It was from Orbetello that Balbo started on his flights to South America and to Chicago (page 354).

The greatest difficulty in building in Italy comes from the well-grounded Italian idea that the customer is always wrong. To counteract this, orders must be given with firmness and no argument permitted. The slightest weakening on the part of the orderer lets loose a flood of counter-proposals!

In rural Italy the carpenter's field in housebuilding is limited. He makes the roof supports, the door and window shutters, and the door and window frames. All else is in the hands of masons, even to the final plastering and tinting of wall surfaces, within and without, and the laying of tiled floors.

The living room plans called for one double glass door, and beside it a stationary French window of the same dimensions. The carpenter came, took careful measurements for the door and window, and retired to his cavelike shop in the village to construct them. In the course of time he emerged from his lair, loaded the results of his labor on donkeys, and escorted them up the hill.

Whether or not the carpenter had lost his measurements and worked from memory was never known, but the door and window were a foot longer and wider than the yawning cavities waiting to receive them.

To the carpenter, this error was a bagatelle. With a happy smile he instantly offered a solution for the difficulty. All he needed, he said, was the loan of two masons. Assisted by them, he would demolish enough of the two-foot-thick walls so that his monstrous mistakes might be inserted. His ingenuous smile changed to a look of incredulity and disgust when we made it clear that his work must be made to fit the house, not the house altered to fit his work.

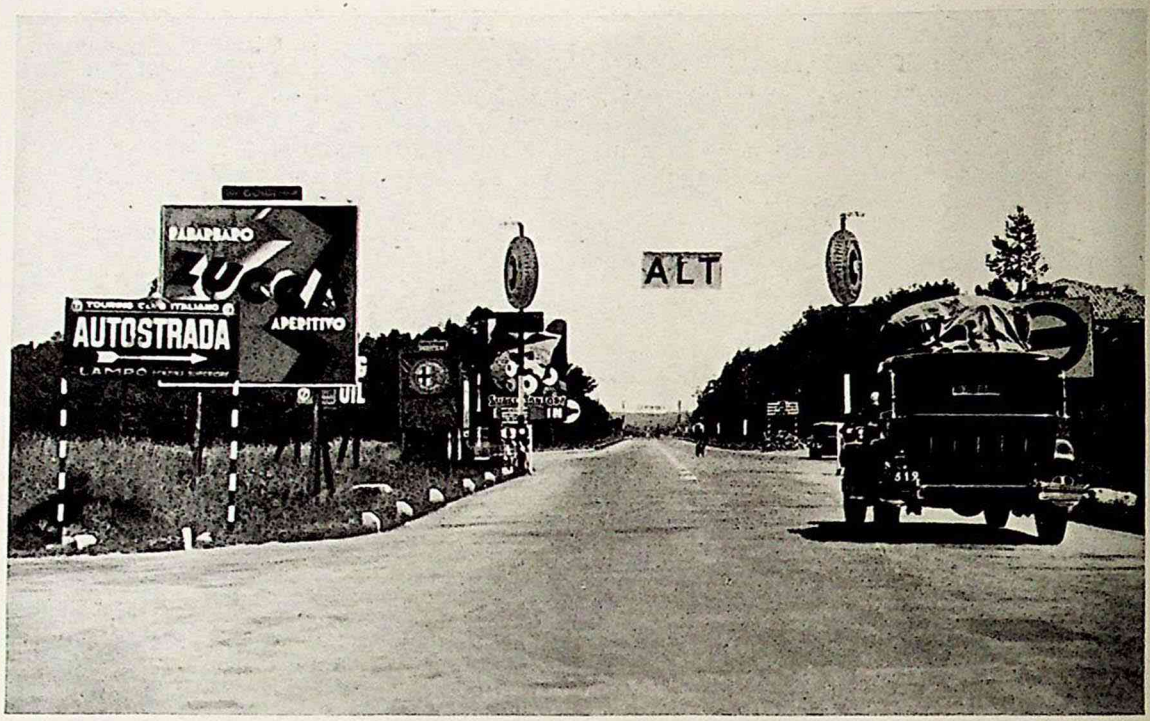
With lightninglike speed he evolved another idea. The glass door and window should be placed against the open side of the loggia to afford shelter to passers-by who might unexpectedly be caught by a shower.

Since we were inhospitable, stubborn, impatient Americans, we found ourselves unable to accept his fertile schemes; but since we were not blessed with the gift of tongues, he was spared the distress of knowing what we thought of his blunders.

COUNTRYSIDE COMBED FOR FIREWOOD

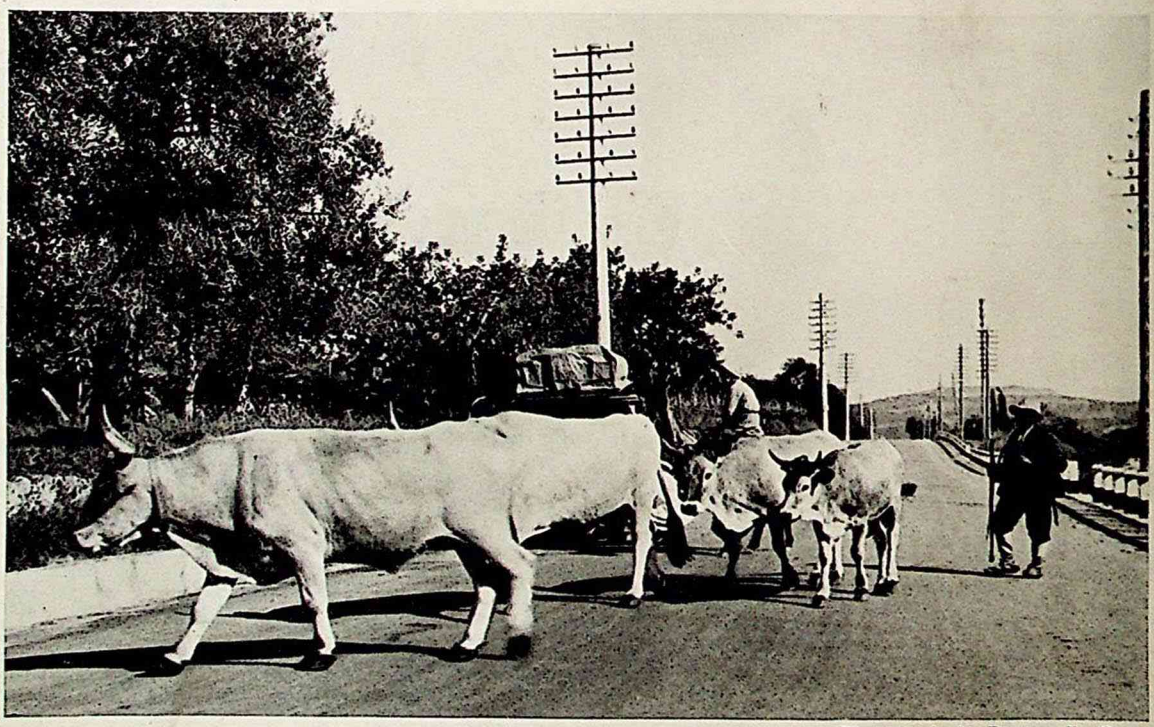
When one begins housekeeping in Italy with a vocabulary of fifty disconnected words and a dictionary, daily problems remain problems for some time. A major one was how to get sufficient wood to feed two terra-cotta stoves and a fireplace. All our cooking was done with charcoal. The promontory and the mainland for many miles in both directions yield a scrub growth suitable for making brush brooms but for little else.

At first the farmer would make a tour of the promontory, find someone who owned a dead fig tree, buy it, chop it down, and bring it home. Unfortunately a fig tree, whether young or old, is good only for shade and bearing figs. When placed on a



NO DRIVER CAN SAY HE FAILED TO SEE THE "ALT," OR STOP SIGN!

This is an *autostrada,* a high-speed automobile toll road. The huge tires on posts on either side are for advertising purposes. Here between Stresa and Milan, as all across the Nation, rough, dusty roads have been transformed into modern traffic arteries (pages 362 and 373).



Photographs by Branson De Cou

CATTLE, NOT ROMAN LEGIONS, NOW TRAMP THE APPIAN WAY

But automobiles and rumbling trucks are far more frequent on this ancient military road, now a modern motor highway (page 375). Linking Rome and Capua, and later extended to Brindisi, the historic thoroughfare was about 15 feet wide and was paved with huge blocks of basaltic lava, some of which are still in good condition.



Drawn by Elbert Jerome Howell

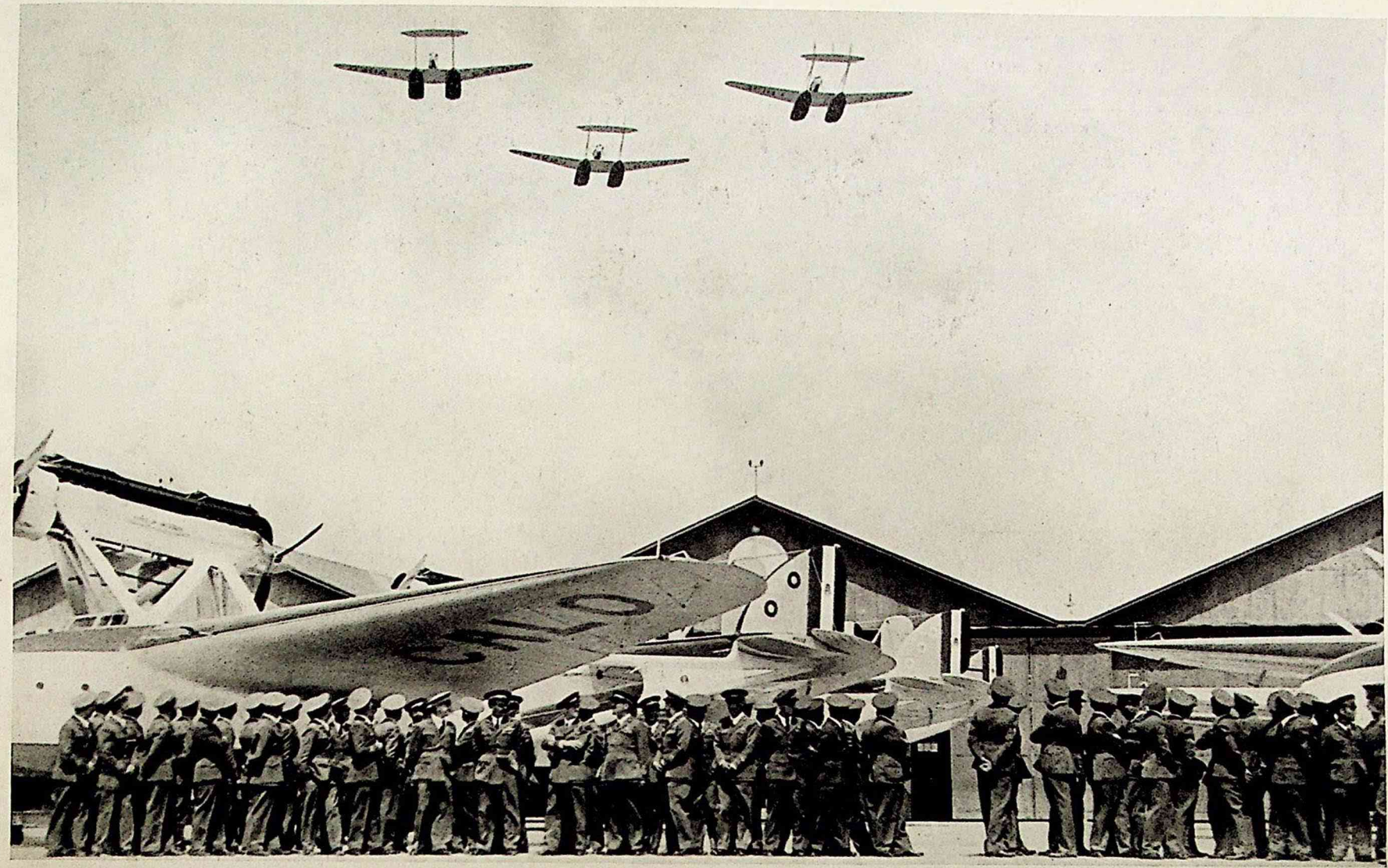
RUGGED MOUNTAINS, DOMINATING THE MAP OF ITALY, MAKE FARMING DIFFICULT OR IMPOSSIBLE OVER WIDE AREAS

At the same time they provide the Nation with two of its chief resources—scenery and water power (page 388). From Carrara in the Apennines comes world-famed white Italian marble. To the north rise the Alps, with the lake district and those strange limestone formations, the Dolomites (page 358). Crowded between the two ranges rests the fertile valley of the Po, with its farms and cities. At Orbetello, across the Tyrrhenian Sea from Corsica, the author makes her winter home (page 351).

fire, it smolders like a bale of woolen goods. We soon learned to reject fig trees and demand almond or olive trees.

The first year that we went to Italy in search of peace and quiet, we left the Paris-Rome express at Grosseto, the county seat, twenty-five miles away. That was the train's nearest stop on its way to Rome. As we wandered the streets looking for what we could pick up, we were stirred at the sight of mallards, teal, woodcock, sparrows, and other "wild" game hanging before the doorways of the markets. Good-sized wild ducks were priced at forty cents apiece, sparrows at five cents each.

Excited by these bargains, we bought freely, and during the winter had more sent us from time to time, to the distress of the cook, who feared that a steady diet of game would affect our livers unfavorably.



Photograph from Pictures, Inc.

GENERAL ITALO BALBO'S FLYING FLEET BEING DRILLED FOR THE 12,000-MILE TRIP TO THE CHICAGO "CENTURY OF PROGRESS" AND RETURN IN 1933

Some of the crew here learn tricks of the trade by watching comrades maneuver in the air. From this large naval aviation station at Orbetello, Balbo's expedition began its flights to both North and South America (page 351).



Photograph from Pictures, Inc.

WILDLY CHEERING ROMANS HEAR IL DUCE BROADCAST THE NEWS THAT THE ETHIOPIAN WAR IS OVER

A huge throng—estimated by Italian newspapers at half a million people—gathered on the night of May 5, 1936, before the balcony of the Palazzo Venezia, left, where Premier Mussolini, in black uniform, was spotlighted against a white screen.



Photograph from Wide World

BALILLA DRUMMERS STAND AT ATTENTION DURING DRILLS IN THE MUSSOLINI FORUM

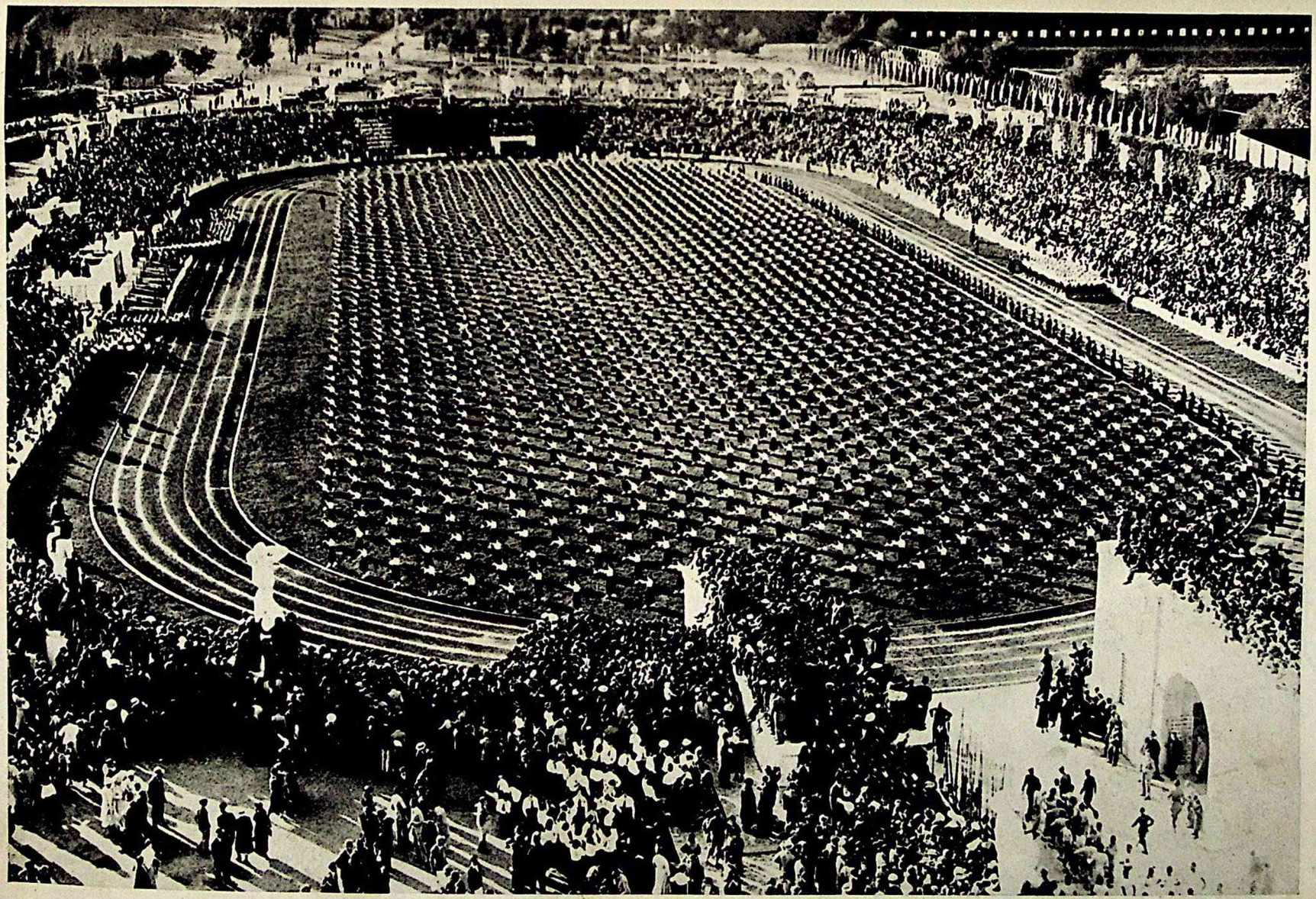
The massive statue represents a young Italian equipped with rifle, gas mask, and helmet. Boys between 8 and 14 belong to the Balilla organization (p. 383).



Photograph from Pictures, Inc.

YOUNG ROMAN MOTORCYCLISTS PASS IN REVIEW ON THE TENTH ANNIVERSARY OF THE FOUNDING OF BALILLA

Premier Mussolini himself is an ardent motorcycle fan, and encourages the use of these light, one-cylinder machines by people who cannot afford automobiles.



Photograph by Acme

THEIR WHITE BLOUSES GLEAMING IN THE SUN, MORE THAN 2,000 GIRLS LINE UP IN ROME'S NEW MUSSOLINI FORUM FOR GYMNASTIC FEATS DURING A MASS DISPLAY OF SPORTS



"TOO STEEP," THINKS THE MULE, HALTING ON AN UPGRADE BESIDE THE LAKE OF GARDA

Flat carts like this, in northern Italy, usually have smaller wheels than those in Rome and to the south. The road was built for automobile traffic, but farm women use it to carry their produce to market in big hand-woven baskets.



Photographs by Branson De Cou

RUGGED ROCKS OF FANTASTIC SHAPES ARE THE DOLOMITES

Streaked veins of striking colors run through some of these snow-fringed limestone peaks, which often turn a glowing pink at dawn and sunset. This car is a long way from home. The "NA" on the license shows that it comes from Naples, hundreds of miles to the south (map, page 353).

A picture of our first night as housekeepers will never leave my mind. For some reason or other I went into the kitchen at midnight. There sat the cook, who had arrived that day, plucking ducks by the light of a single candle. If a cook comes with the intention of staying, nothing discourages her.

Now we have eschewed all game. After nine years we think we have learned about everything that can be found in the village. This has been a hard struggle, for Italian cooks seem to have an aversion to making suggestions. Information must be ferreted from them. In the past, if any dish was ordered three times, it was taken for granted that the dish was a passion with us. In reality it was ordered because we could think of nothing else to order. The cook, not sensing the situation, would have forced it on us indefinitely unless forcibly restrained.

BANDANNA SERVES AS MARKET BASKET

Each morning after the cook has had her breakfast, she picks up her list of orders for the day and her yard-square bandanna handkerchief in which she carries home the provisions, and descends to the village to do the marketing and get the mail.

All Italy is on a cash-and-carry, day-to-day basis. This is true of life in the cities or in the country. Each item purchased by a servant is entered in an account book which is shown to the mistress when more money is needed.

Last winter, for the first time, some staples were laid in in bulk to last through the season. This was because prices were repeatedly increasing on account of the war in Ethiopia. Therefore, soon after our arrival, the farmer went to the village with the donkey and loaded him with $12 worth of laundry soap, $25 worth of coffee, a $12 segment of rocklike Parmesan cheese to serve grated on almost everything, as well as rice, salt, and sugar.

This was the only way the war touched us. Coffee has always been expensive in Italy, and the war caused it to double and treble in price. Tea is an affectation with a few Italians, but coffee is universally enjoyed and desired. Ethiopia raises some of the finest coffee in the world and Italy plans on profiting from the coffee crops while searching for hidden minerals and oil wells.

One problem that it took us nine years to solve was the wine question. All small town *cantinas,* or barrooms, are supplied with wine made by the farmers of the locality. The cook takes an empty two-quart flask, or *fiasco,* to her favorite cantina and has it filled. If it suits your taste, you at first think how fortunate you are to have such good wine. It is a sensation comparable to eating your own home-grown vegetables.

A few nights or a few weeks later you take a sip and something strange has happened. It may have become sickeningly sweet or distressingly sour. The servants are summoned and requested to state the reason for this singular chemical change. Their answer is invariably the same. "It is nothing, signora. The other wine is finished and this is what Beppina brought home this morning."

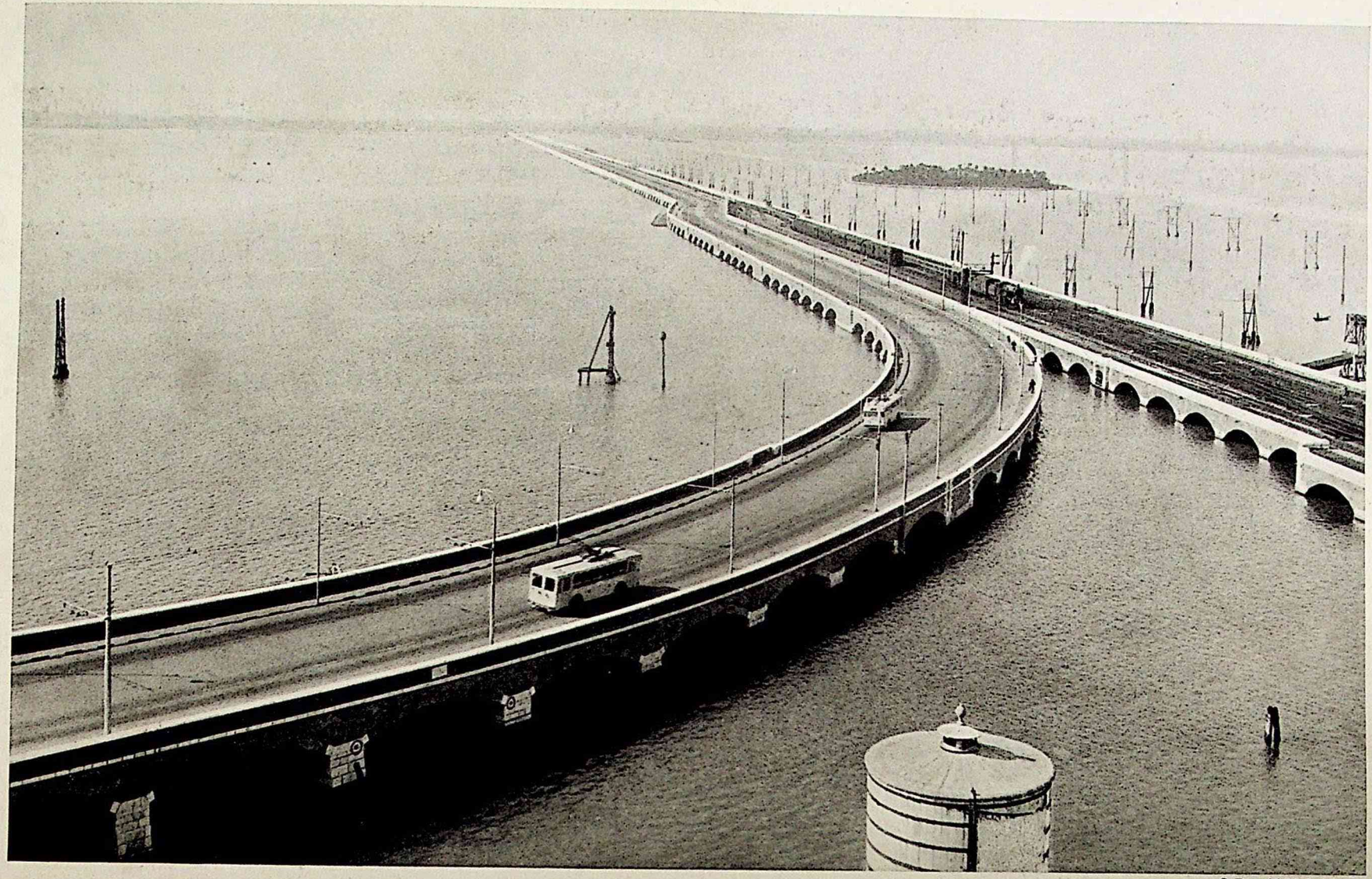
We asked if there wasn't someone who had really superior wine. We were told there was *vino scelto,* "choice wine," which cost a little more. That was sent for post-haste and we hoped our problems were solved. But what they brought us proved to be a heavy, sweet, dessert wine.

After this disappointment seven flasks were brought out, washed, and a label pasted on each. Beppina was instructed to visit seven cantinas, fill a bottle at each, and write the name of the cantina on the label. Then there was a sampling, and a supply of the most satisfactory sample was ordered.

Usually a cantina refuses to sell more than ten quarts of wine, on the ground that if it sells too much it won't have enough left for its customers. Consequently, our wine-buying was attended with indifferent success for eight years.

There is something romantically appealing, as a rule, in the tales recounted by those who live at small expense in out-of-the-way places. Such people invariably—to hear them tell it—have servants who look like English butlers and French maids, and converse quaintly in proverbs similar to those in Bartlett's "Familiar Quotations."

Picturesque native costumes are not worn in our part of the country. The men wear overalls patched with pallid relics of long-gone garments. The women wear dresses vaguely reminiscent of well-worn cotton umbrellas. Nevertheless, at first we felt our two sturdily built helpers would add an air to the place if they were decked out in a bit of Old World quaintness.



© Donald McLeish

LITTORIO BRIDGE CONNECTS VENICE WITH THE HAZY MAINLAND, TWO AND A HALF MILES DISTANT

The wide, new structure, curving out from Venice, parallels the older railway trestle. Trackless trolleys ply back and forth on the bridge, which has special lanes for cyclists and pedestrians. Motorists arriving from the mainland park their cars in an enormous new garage in the city's outskirts and go into town by gondola, small steamer, or the more expensive gasoline speedboats, Venetian substitutes for street cars and busses. Dotting the shallow lagoon are numerous islands like the one near the bridge.



Photograph by Branson De Cou

FOCUS OF MILAN'S LIFE IS THE PIAZZA DEL DUOMO, WITH ITS HUGE CATHEDRAL AND STATUE OF KING VICTOR EMMANUEL II

The English poet Shelley described this church as being "cut into pinnacles of immense height, and the utmost delicacy of workmanship, and loaded with sculpture." Opening onto the Piazza, left, is the Galleria Vittorio Emanuele II (page 385).

In the spring of 1935 the prospective war in Ethiopia was viewed unemotionally by the mass of Italians. Little was known about the country, except that it was a place where bananas grew. Bananas, to the mind of a resident Italian, are perhaps the most desirable of all fruits. He regards them as a truly regal dish, just as some people regard caviar. He has almost the same feeling toward them that colored people are supposed to have toward fried chicken.

At that time two young soldiers, on their way to a training camp, were engaged in conversation by an Italian woman who shared their compartment in the train. She wanted to know if they weren't thrilled at being called for the campaign in Africa.*

They were not only unthrilled, but had given the matter little thought. They were not married and felt they might as well go there as anywhere.

"But," she said, "you will have all the bananas you want! You will be allowed to help yourselves, just as we permit people to enjoy our grapes!"

The young soldiers remained unmoved. Possibly they came from families that, like most Italian families, kept their grapes for themselves.

At the same time, however, Italian men of property felt the step must be taken and Italy's acreage increased, but the wives of these same men were loath to think of their sons being called to the colors.

With the imposing of sanctions the sentiment, particularly in cities, changed completely. The thought that many countries should tell Italy what she might or might not do, and coerce her into obeying their dictates, aroused a feeling of passionate nationalism and a grim determination to die rather than to submit to foreign domination.

After witnessing some of the new enthusiasm in Naples and Rome, we felt it must be universal. On our arrival at our out-of-the-way hilltop we found the farmer's son at home and expressed pleasure that he had not been summoned to Africa. "How has it happened?" we asked. He shrugged. "It's a miracle," he admitted.

We found that while young men in country towns were quick to parade and sing in celebration of victories, they were not averse to remaining at home, working in the vineyards or at their jobs as masons, plumbers, painters, and carpenters.

In times like these, people in other countries are filled with amazement and apprehension for those who venture into a country at war, even though the actual fighting is three thousand miles away. However, persons living or traveling in a warring nation are often untouched by the war until they venture within about twenty miles of the front-line trenches.

The feeling in Italy for a few months was bitter and hostile toward England, and a few anti-English demonstrations took place. But it has always been a simple matter for any foreigner, English or otherwise, to travel freely and with the utmost safety in Italy at any time, provided he takes the trouble to behave like a Bostonian on a Boston-New York train, who keeps his gloves on and speaks to no one.

HIGH-SPEED HIGHWAYS CRISSCROSS THE NATION

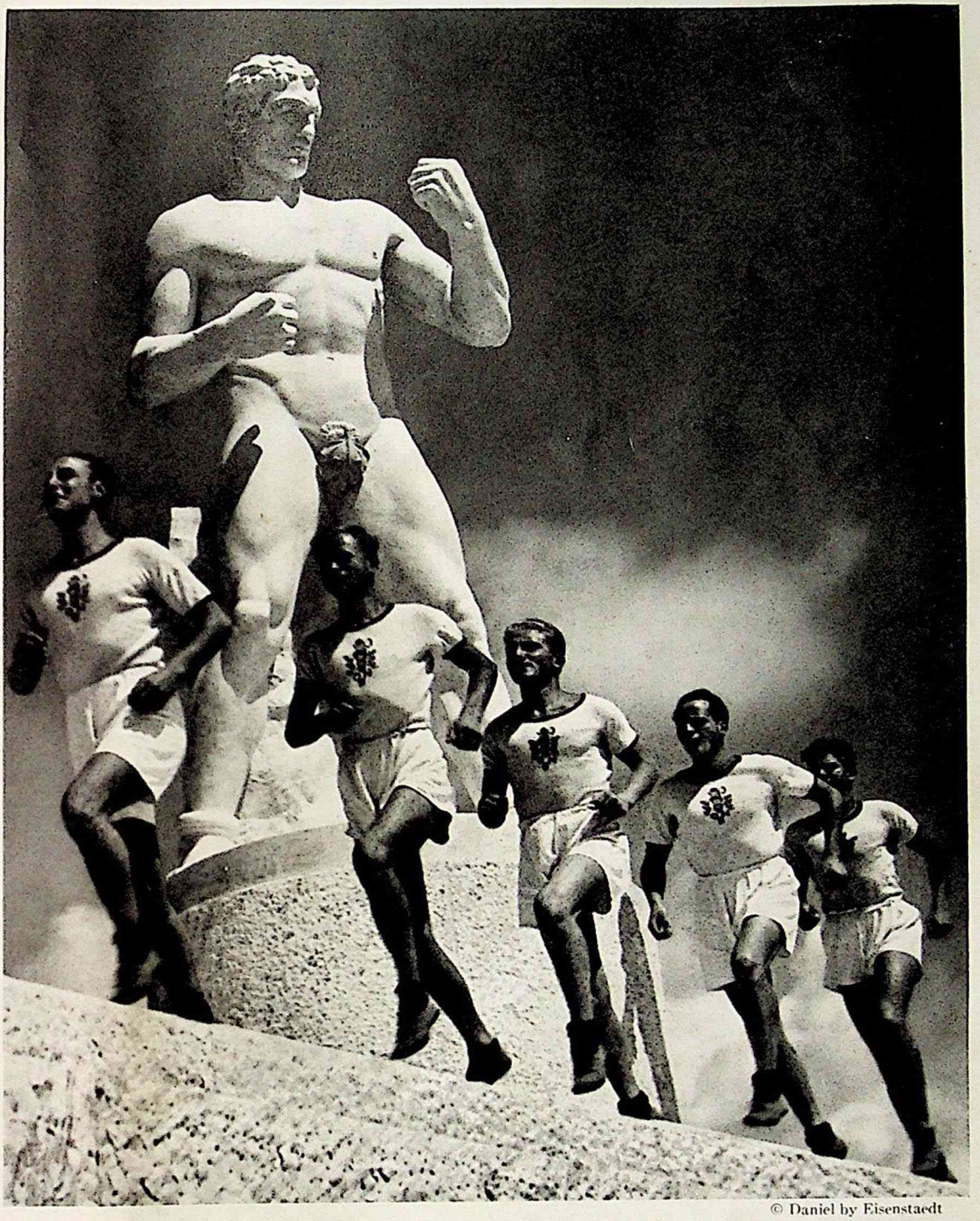
Travel conditions improved slowly in Italy before the Fascist regime. Since the Fascists came into power, roads and railways have advanced by leaps and bounds.

In 1928, when we first motored from Naples to Orbetello, the main road was a succession of potholes, ankle-deep in pallid dust. An automobile progressing over that road had the appearance of a comet—a small object followed by a billowing tail of gray powder. Every main road in Italy was the same.

In 1933 we made a swing by motor up the west coast road from Naples to Genoa, across the north of the country, through the valley of the Po and Padua to Venice; down the east coast road to Ferrara, Rimini, and the picture postcard Republic of San Marino; then across the mountains to Florence, on roads not sufficiently important to be listed on the map we carried. Every road on which we traveled was a hard-surfaced road, as smooth as a boulevard and practically free of dust. This miracle of road building was accomplished in less than five years.

The trains have become more up-to-date and successfully live up to the Nation's boast that they always arrive on time. Some of this improvement has been achieved by scheduling long waits in railway stations. A train which is permitted to take out several minutes at one station can afford to dawdle a little along the way.

* See "Traveling in the Highlands of Ethiopia," "With the Italians in Eritrea," and "Hunting Castles in Italy," in the NATIONAL GEOGRAPHIC MAGAZINE, September, 1935.



© Daniel by Eisenstaedt

BRONZED ATHLETES, LIKE STATUES COME TO LIFE, JOG PAST A MIGHTY MARBLE BOXER IN THE MUSSOLINI STADIUM

The runners are future gymnasium teachers studying at the Fascist Academy of Physical Culture at Rome. In perfect unison they trot around the upper rim of the arena in the vast sports center begun in 1931 north of the city beside the Tiber River (page 357). The statue towering above them is one of about 60 figures, representing different athletic types, which were presented by Italy's provinces. In addition to this stadium, seating some 20,000 spectators, the Forum has well-equipped playing fields for the many kinds of sport encouraged by Il Duce's Government.



© Donald McLeish

ROME'S NEW "ROAD OF THE EMPIRE" RUNS ARROW-LIKE PAST HISTORIC RUINS TOWARD MUSSOLINI'S OFFICES

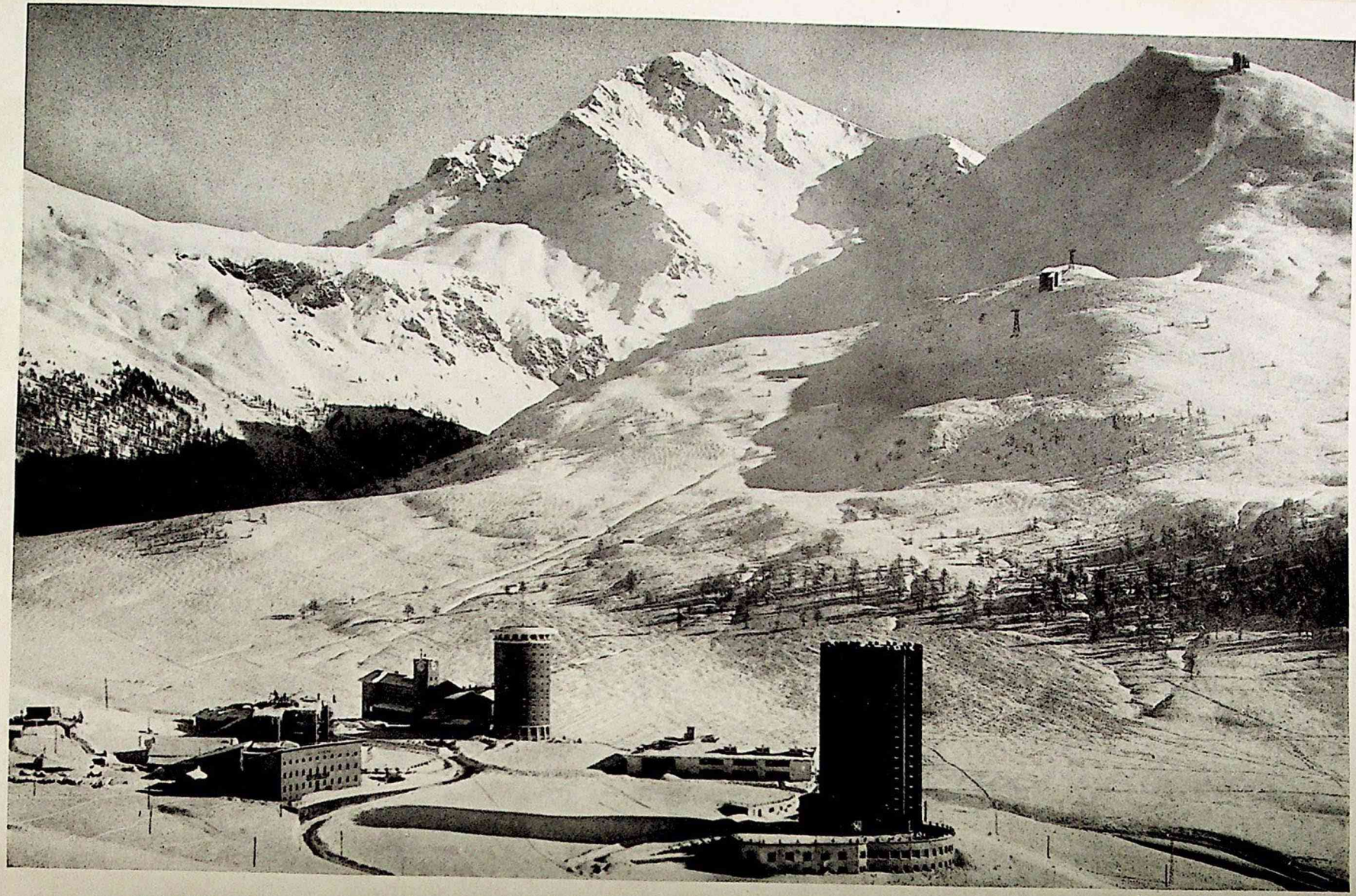
Follow the white line and you come to the balcony of the Palazzo Venezia, where Il Duce addresses the populace (page 355). If an old-time Caesar could come to life and gaze from the Coliseum near here (page 379), he might recognize some of the ancient pillared structures on the left, but he probably would rub his eyes at the glistening white mass of the National Monument, crowned by winged statues driving chariots. A group of young blackshirts strolls along the Via dell' Impero, where horse-drawn carriages are surprisingly common.



Photograph by Burton Holmes from Galloway

PLOWS FOR THE FORMER SWAMP LANDS!

Virtually depopulated for more than 2,000 years, the vast, malarial Pontine Marshes between Rome and Naples have been transformed by a maze of drainage ditches into a model agricultural area (see page 368, and "Redemption of the Pontine Marshes," NATIONAL GEOGRAPHIC MAGAZINE, August, 1934). Capital of the region is four-year-old Littoria. On the outskirts is this tile-roofed farmhouse; the family occupies the two-story section, and the adjoining wing, with arched entrance, is the stable. Most of the houses are painted light blue, a color supposed to keep flies away.



TUBULAR HOTELS AT SESTRIÈRES HOUSE DEVOTEES WHO COME TO TEST THEIR SKILL ON 70 DIFFERENT SKI RUNS

Photograph by Piero Manetti

Cableways take parties up Mt. Sises, right, and Mt. Banchetta, extreme left. Thus skiers enjoy swift downhill runs with a minimum of exertion. The unusual hotel construction gives each guest an outside room, with a broad panorama of the Cottian Alps which surround this resort, 37 miles west of Turin



Photograph by Burton Holmes from Galloway

A SINGLE DAY'S GRAPE HARVEST PAVES THIS WINERY STORAGE YARD IN THE ABRUZZI

With noticeable satisfaction, the pickers—men, women, and children—survey the heap of ripe, luscious bunches, only part of their annual crop. Italy ranks second only to France among the world's wine-producing nations, and consumes a large percentage of her output.



Photograph by Burton Holmes from Galloway

LONG-HORNED OXEN, TALL AS A MAN, TILL RICH BLACK FIELDS TO AUGMENT ROME'S FOOD SUPPLY

Just ahead of the sleek team runs one of the ditches that drain the former Pontine Marshes. Here, under Government supervision, a family may purchase a plot of about 30 acres for small annual payments. By December, 1934, about 60,000 ex-service men had settled in this reclaimed area, cultivating some 100,000 acres of grain and vegetable crops. Most of the colonists have come from overpopulated central and northern Italy (page 365).



Photograph by Fritz Henle from European

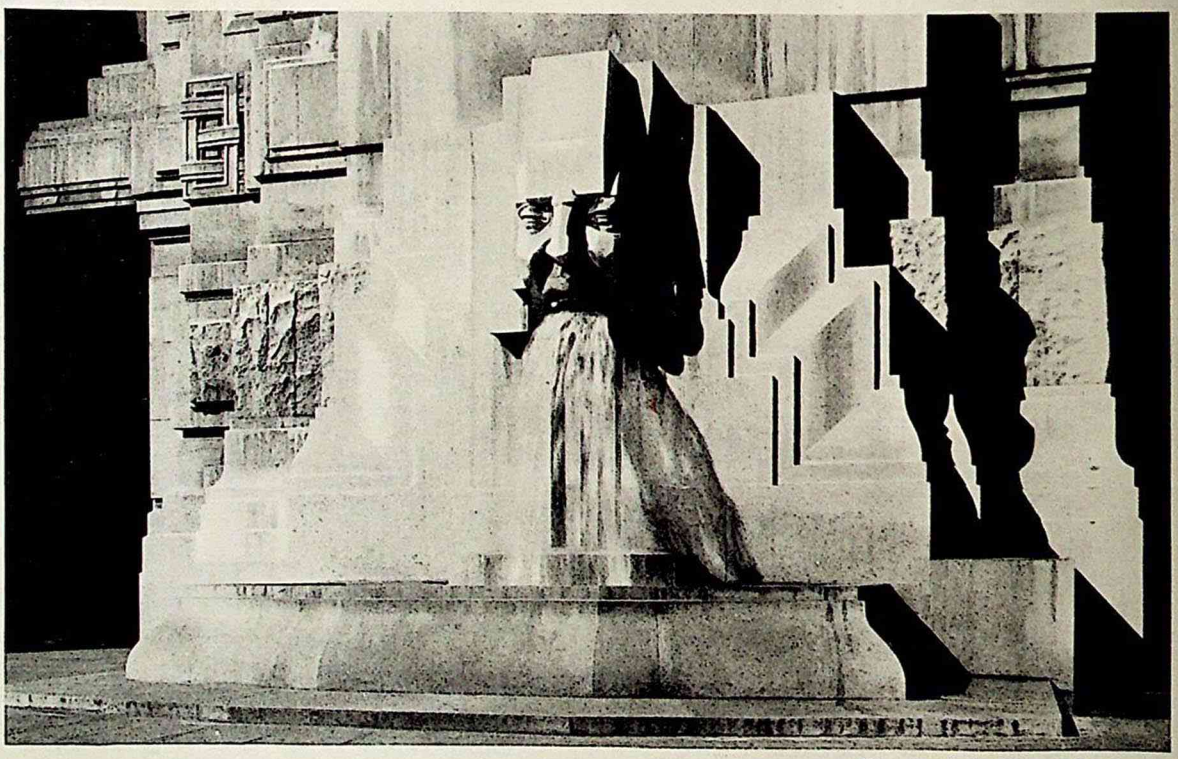
FLORENTINE CABBIES HOIST UMBRELLAS WHILE WAITING IN THE RAIN FOR FARES

Blankets protect the horses, which kind-hearted Italian drivers regard as friends and business partners. Such *carrozzelle*, often with patched tops, line up at stations to meet trains.



A TINY FASCIST SITS ENTHRONED ON HIS MOTHER'S ARM

In four or five years he will be eligible to don the uniform of the "Sons of the Wolf" (page 350). A cage with the family pet hangs on the wall of this home in a roadside village between Florence and Bologna.



Photographs by Branson De Cou

HE MIGHT BE "GOD OF THE RAILWAY," IF THIS WERE ANCIENT ROME

Latins of old had deities for nearly every phase of life; but this grotesque head is merely a fountain on Milan's new railway station, one of the largest in Europe.

In a first-class compartment on a train the foot must not be placed on the seats until the plush has been well protected by a paper or some extra garment.

If a thoughtless traveler neglects this precaution, a guard, endowed with second sight, is at once at the compartment door and sternly makes him realize he is fortunate to be permitted to end his days in possession of the offending foot. Not many are thoughtless a second time. However, should you be traveling with a small dog, you buy a ticket for the dog for a nominal sum, and the pet is allowed to sit on the plush, feet and all!

ONE-WAY SIDEWALKS IN ROME

There is another regulation that high and low must observe. The large cities have strips marked off in their busy streets which pedestrians are to use for crossing. In such places jaywalking is not allowed and traffic officers are at hand to shoo absent-minded people inside the strips.

Rome has one-way sidewalks on some of her narrow streets—the popular Corso Umberto, for example. If you leave a shop and want to walk against traffic to get to another shop a few doors farther along, the stern eye of the law is at once upon you. Sometimes it is lenient and sometimes not.

One of the first things the Fascist government did was to begin the building of ocean liners. From the beginning they were comfortable and popular boats. They continued to build, always better, bigger, and more luxurious vessels, keeping the newest for the New York route and substituting the earlier ones for the South American trade. Today they have splendid services to South Africa, India, and the Far East as well (page 373).

The Italian Line boats which now ply between New York and Italy are equal to the finest afloat. The cheerful, friendly atmosphere is not surpassed on any other ships that sail the seas. Perfect service is a matter of training, but friendly, cheerful service is a matter of disposition.

Every member of the ship's personnel seems to wish to make the crossing agreeable to each passenger. If you cross several times on the same boat, or meet a former steward on another of the Italian ships, he greets you with real pleasure.

For several years we have taken a wire-haired terrier to Italy with us. Stewards on Italian liners have repeatedly recognized the dog and called it by name—an attention hard to equal.

Italians are passionately devoted to children, and the stewardesses make life on shipboard easy for mothers who travel without nurses.

The halcyon days have passed when foreigners, who were content to rest quietly in a place for a while, could enjoy the amenities of life for a dollar a day. Those tales make pleasant bedtime reading, but have passed into the soft blue haze of forgotten things, along with penny candy, winter underwear, and the exhilaration of a trolley ride.

Today a person travels in Italy as economically or as expensively as he wishes. The new hotel coupons and travelers' checks issued abroad to foreigners at a more favorable rate of exchange make his sojourn more economical.

GASOLINE AT $1.24 A GALLON

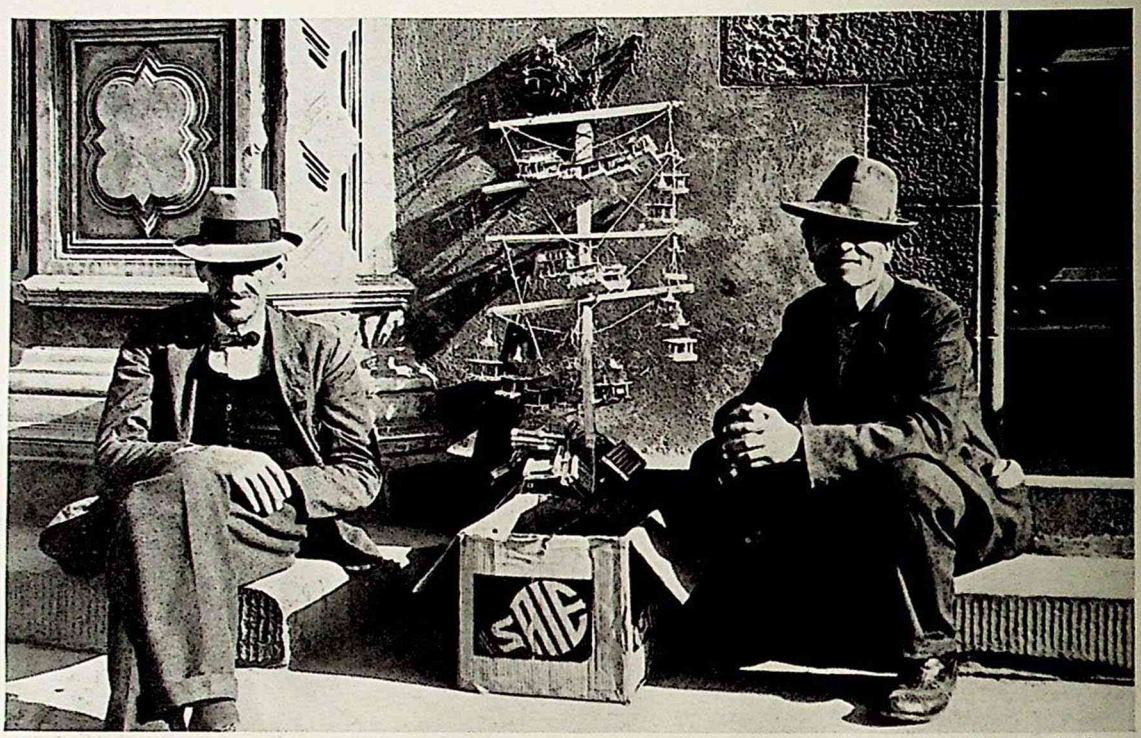
Motoring, however, is another matter. Italy has to import gasoline and oil. Motoring is a joy if money is no object. If it is an object, the beauty of the countryside or of a picturesque hill town is somewhat dimmed by computations, on the backs of old envelopes, of the staggering costs of a full gasoline tank.

As long ago as 1930 an American, accustomed to groaning at State taxes which obliged him to pay 20 cents a gallon, was horror-struck in Italy when forced to pay 40 cents a gallon.

In 1935 and 1936 up to the time this is written, however, 40-cent gasoline in Italy would have been considered a gift. The American dollar had depreciated in value, and the war in Africa had sent prices skyrocketing. The price of gasoline was greatly increased in order to conserve every drop for the air force and the motorized units. Ordinary gasoline cost $1.24 a gallon. Ethyl gasoline was $1.36 a gallon.

The result was that for economic and patriotic reasons many automobile owners put up their cars.

Although this brought idleness and short rations to all garage and auto repair men, the Government refused to permit proprietors to close their shops and lay off employees. In many cases this had to be done willy-nilly, which in turn was hard on the owners of the buildings and so on all down the line.



Photograph by Branson De Cou

"WANT TO BUY A CRICKET?"

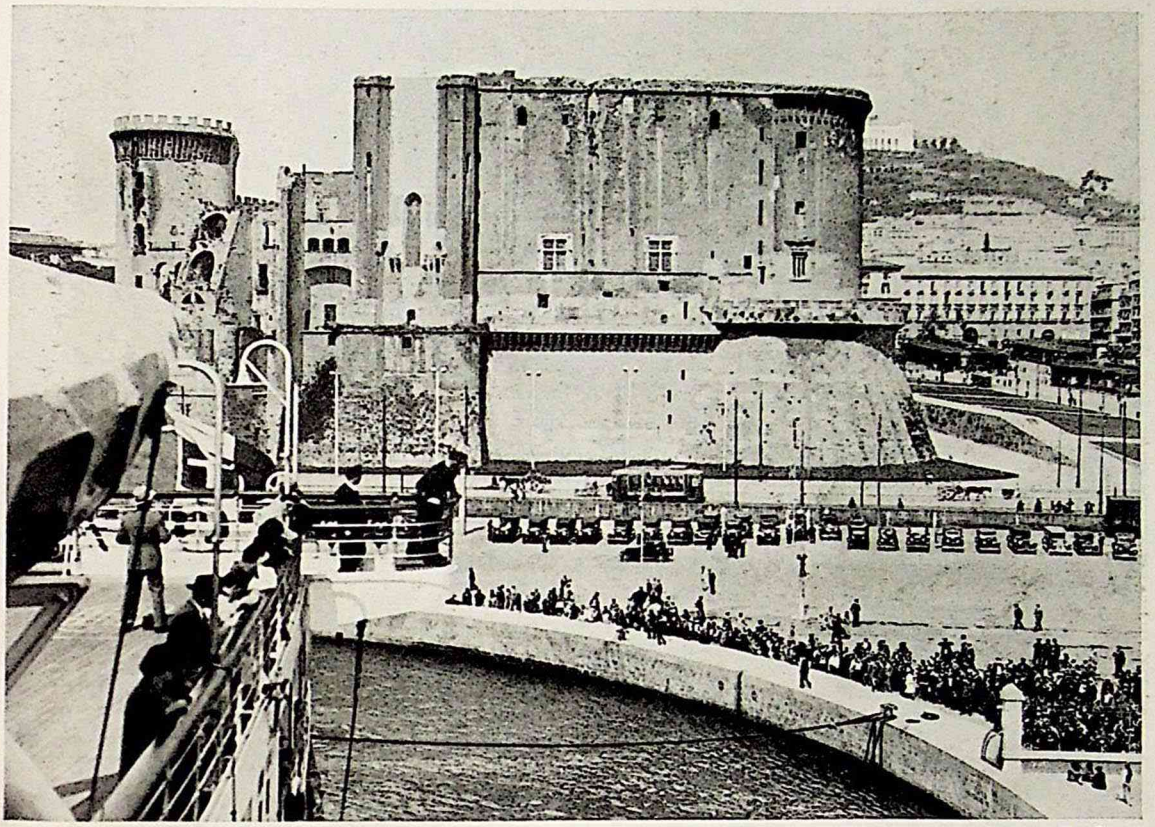
On the annual "Cricket Day" in Florence, the chirping insects are sold in wooden cages as household pets.



Photograph by Vitullo

"NO. 71" COMES TO A BRIEF HALT DURING THE ANNUAL THOUSAND-MILE RACE

Charcoal gas provided fuel for this machine in experiments with gasoline substitutes during the 1936 *Mille Miglia*. Run on a Sunday, when spectators are free to mass themselves in knots at dangerous curves, the race begins at Brescia, proceeds southward to the outskirts of Rome, eastward to the Adriatic, and back to the starting point (page 384).



Photograph by Branson De Cou

JUST IN FROM NEW YORK, THE "CONTE DI SAVOIA" DOCKS AT NAPLES

Welcoming crowds line the water front before the massive Castel Nuovo, former residence of the House of Anjou. The castle was more than two centuries old when the Italian sailor Columbus discovered the New World. Today Italy's ships are among the finest afloat (p. 371).

We had found from bitter experience that the mental stress of motoring was lessened if an emergency two-gallon can of gasoline was carried in the car. In November of 1935, when we landed in Italy for our annual stay, we asked to have this can filled at the first gasoline tank at which we stopped.

"*Non é possibile,*" we were told. Gasoline was forbidden by law to be put anywhere but in the tank. Not another drop could be carried away without written permission from a certain ministry.

If a motorist in Europe runs out of gas there is no country where, as in America, one can coast to the next filling station. This is particularly true in Italy, where it is not unusual to draw thirstily up to a lone tank and find the proprietor has gone to the country to tie up his grapevines, and taken the key with him.

If you can bring yourself to forget your pocketbook, there are few countries in Europe where motoring is more enjoyable than in Italy. Not only have perfectly surfaced roads been built the length and breadth of the country, but more are constantly being made, narrow bridges are being replaced by wider ones, and, where possible, dangerous curves are being eliminated.

By-passes circle many of the towns, so that one must look sharp unless he wishes to miss the unimportant-looking road leading to the quaint, narrow streets with their tall, ancient buildings, the piazza, colorful with its market crowds, the beautiful churches, fountains, and all the rest that one has come to Italy to see.

Many main highways, as well as secondary roads, have been planted with endless regiments of umbrella pines, cypresses, eucalyptus, and other varieties of trees. In another ten years they will make motoring in midsummer almost as comfortable as in the spring and far more beautiful than before. Roadsides are edged with narrow strips of grass. Men armed with sickles and hand shears keep them closely trimmed.



Photograph by Branson De Cou

ROME'S CENTURIES-OLD RAG FAIR DRAWS THRIFTY SHOPPERS

Gaily colored shawls, pottery, antiques, and other wares are displayed at low prices every Wednesday at open-air stands in the Campo dei Fiori. Italy is trying to perfect cotton substitutes in order to become independent of foreign growers.

In several parts of Italy there are special motor highways, *autostrade* (page 352). On them motorists must diverge to the right or left to reach adjacent towns, for no road crosses an autostrada. All crossroads are on an overhead level.

In the olden days it was a long, dusty carriage drive from Naples to Pompeii, and a full and exhausting day was required to go there, see the ruins, and return. Today steamer passengers who have only a few hours in port step into a car at the dock, are whisked over the autostrada to Pompeii in about half an hour, step smartly through the narrow streets with their well-worn chariot ruts, see the principal sights, and are back again on the steamer no more fatigued than by a dozen circuits of the deck.

In the last half-dozen years Rome has undergone great changes. Some few people mourn the widening of streets and the tearing down of small, squalid buildings which gave the city an older look. The majority agree that all that has been done is a vast improvement (page 379).

NEW DELIGHTS IN THE ETERNAL CITY

The tearing down of these buildings, built a hundred or two hundred years ago and housing the poorest of the city's population in dark, airless, unhealthful quarters, has now disclosed to view many of the glories of ancient Rome. At the same time the former inhabitants of these buildings have been moved into airy, modern apartment houses on the outskirts of the city.

The change that most forcibly strikes the returning traveler begins at the Piazza Venezia. This large public square at the



ANCIENT ROME'S APPIAN WAY BECOMES A MODERN MOTOR ROAD

Snorting uphill beneath a frowning old castle in the village of Itri, a big truck rumbles along the repaved "queen of roads," built by Appius Claudius Caecus in 312 B. C.



Photographs by Branson De Cou

UNIFORMED GUARDS STAND WATCH AT THE PALAZZO DEL SENATORE AS GUESTS ARRIVE FOR AN OFFICIAL FUNCTION

In this building on Capitoline Hill are the offices of Rome's "Governatore." The man with plumed hat resembles an admiral or field marshal in full dress, but actually he is only one of several thousand similarly costumed gendarmes.



Photograph courtesy ENIT

SKI ENTHUSIASTS HEAD FOR THE DOLOMITES THAT ENCIRCLE CORTINA D'AMPEZZO

A younger sportsman rides on a sled past buildings bedecked with Italian flags. Behind the Concordia Hotel a ridge of the Alps towers over the resort, which is popular in summer as well as winter (pages 358 and 384).

end of the Corso is bounded on one side by the beautiful Palazzo Venezia, where Mussolini carries on the business of government and from the balcony of which he addresses the thousands upon thousands of ardently devoted Italians who crowd shoulder to shoulder to hear his impassioned speeches (page 355).

The end of the piazza facing the Corso is filled with the huge monument to Victor Emmanuel II, built in the style of the Caesars, and the resting place of Italy's Unknown Soldier. Esthetes claim to find this white marble structure, glittering with gilded statuary, too gaudy, too garish. Yet to me it seems no more so than were the great buildings of ancient Rome.

Until a few years ago a narrow street led out of the Piazza Venezia on either side of the monument, and countless small, dark buildings nestled against the sides and back of the gleaming white structure. Now, as you face the monument, the hovels have given way to two broad avenues, the Via dell' Impero on the left (page 364) and the Via del Mare on the right.

The Via dell' Impero, bordered on both sides by the ruins of the times of the emperors and now unobstructed by buildings of more recent date, sweeps with an unbroken vista to the Coliseum. At night the Coliseum is floodlighted and presents a spectacle that would have caused Nero to drop his fiddle and gape with amazement.

Along the Via dell' Impero are the three colossal arches of the Basilica of Constantine, erected by Maxentius (p. 384). Under these arches on warm, moonlit summer evenings the foremost symphony leaders conduct open-air concerts. The fee for a chair is a few lire. Those who stand may enjoy the concerts for nothing.

The Via del Mare, to the right of the monument, leads past the Theater of Marcellus, which has been cleared of its encroaching buildings and the small shops within its arches, and on to Ostia by the sea.



Photograph by Branson De Cou

EXCAVATIONS SHOW HOW ROME'S STREET LEVEL HAS RISEN THROUGH THE AGES

Accumulated dust of centuries buried the ancient city of the Caesars, which the Government is now uncovering. The worn column in front of the big sculptured head is encircled by iron bands to prevent the stone from cracking.

Ostia has become the seaside playground of the Romans. It is connected with Rome by a perfect motor road 14 miles in extent, while fast electric trains carry unnumbered thousands to the sea for a few cents.

STATE-ORGANIZED ATHLETICS FOR ALL

Just north of Rome stands the Mussolini Forum, built beside the Tiber with the green hills of Monte Mario as a background. The top of the low stadium is adorned with statues representing the various provinces, each depicting some form of physical prowess. In this modern forum are swimming pools, fields for every form of sport, and terra cotta colored houses where Fascist physical instructors are trained (page 363).

In former days Italian gentlemen fenced and rowed, while the peasants indulged in games of bowls in tavern yards or streets. No sport is a closed book to the young Italians who are growing up today; at the same time participation in these sports is compulsory.

A striking feature of the Mussolini Forum is the colossal monolith of white Carrara marble. This was hewn from the famous quarries at Carrara as a labor of love for Il Duce, was transported by sea free of charge, and borne up the Tiber on barges amid the playing of bands and the joyous acclaim of the populace.

A few years ago no growing Italian girl was permitted to wander far from her mother's side. Her chief diversion was sewing. Today she participates in athletics as freely as her brother.

After a strenuous afternoon at the Mussolini Forum groups of girls leave the field singing lustily. Trolley cars that carry them to and from their sports are crammed to overflowing with young girls filled with exuberance and giggles—overflowing, as the French so euphemistically remark, with *joie de vivre*.

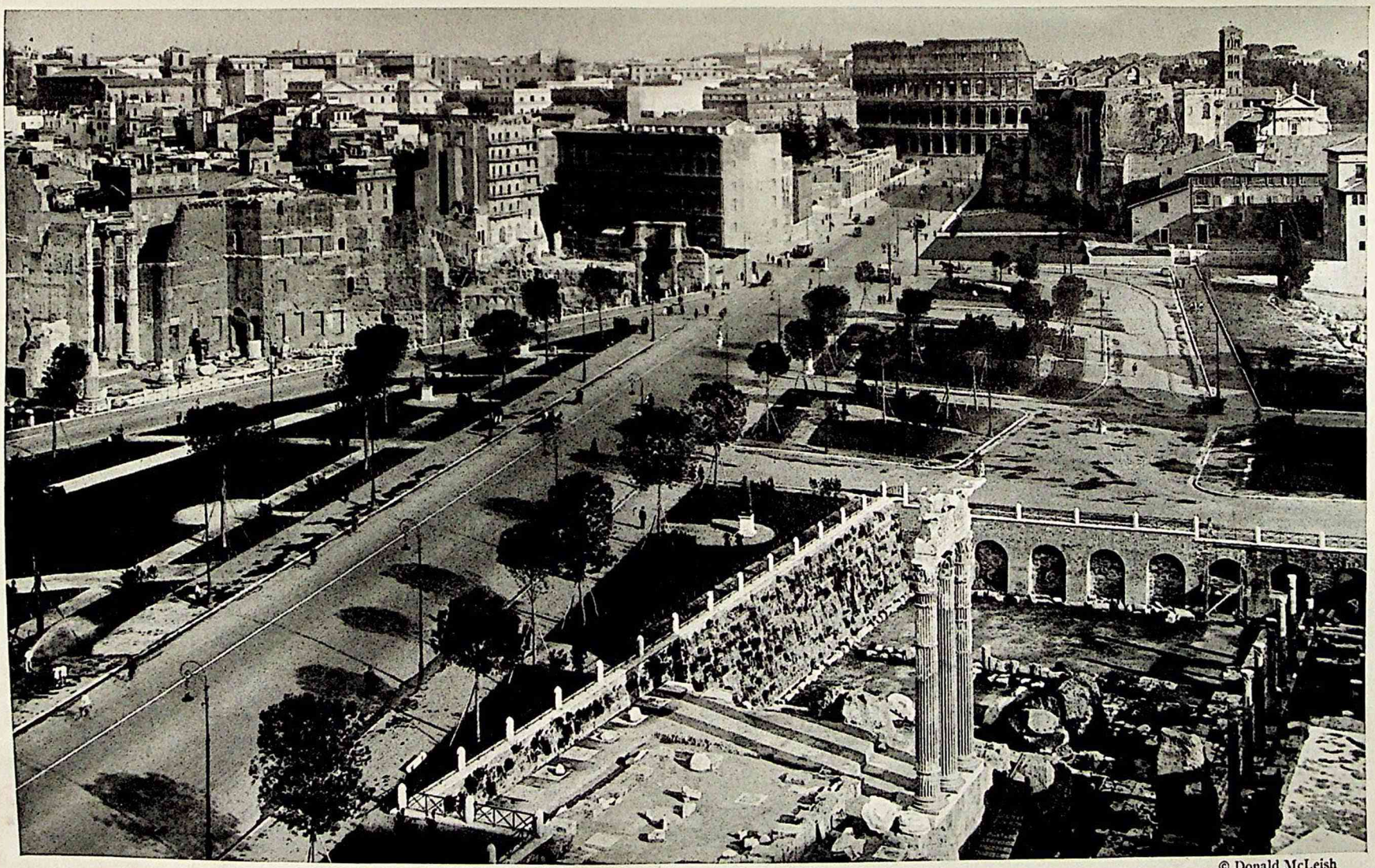
Another major change in the life of the young is partly responsible for the present ebullient spirits. In the old days children



Photograph by Branson De Cou

BACK WINDOWS OF JEWELERS' SHOPS PROJECT OVER THE ARNO RIVER FROM THE PONTE VECCHIO, "OLD BRIDGE" OF FLORENCE

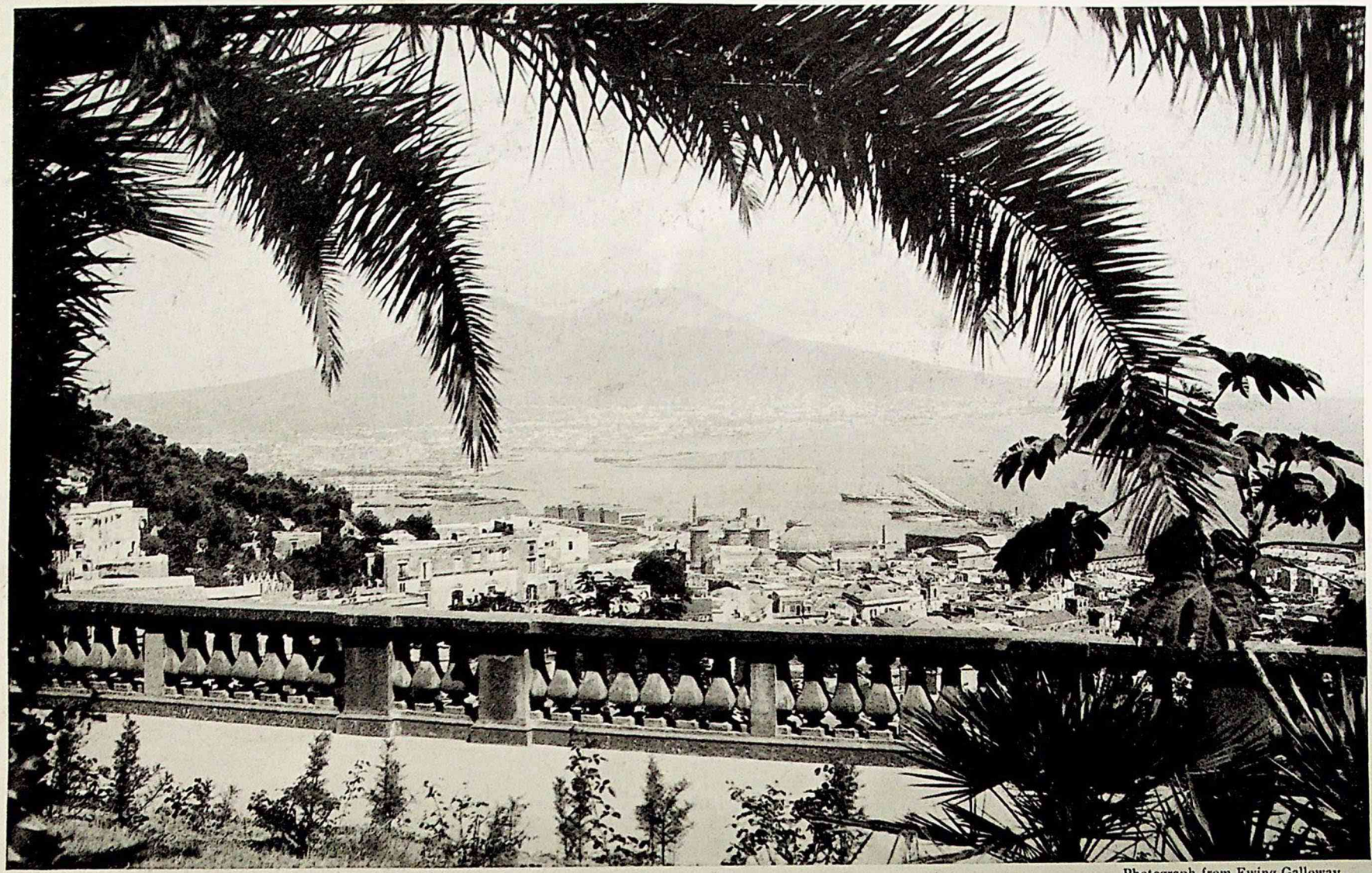
Other structures crossing the muddy stream are all more recent than this, which was rebuilt in its present form nearly six centuries ago. The tile-roofed gallery, with barred windows, connects two buildings housing celebrated art collections: the Palazzo degli Uffizi, right, and the Palazzo Pitti. Oarsmen are often seen sculling on the river, which, flowing from the mountains, is heavily silt-laden in the rainy season.



© Donald McLeish

SOME OF "THE GRANDEUR THAT WAS ROME" IS BROUGHT TO LIGHT AS RUINS ARE UNEARTHED

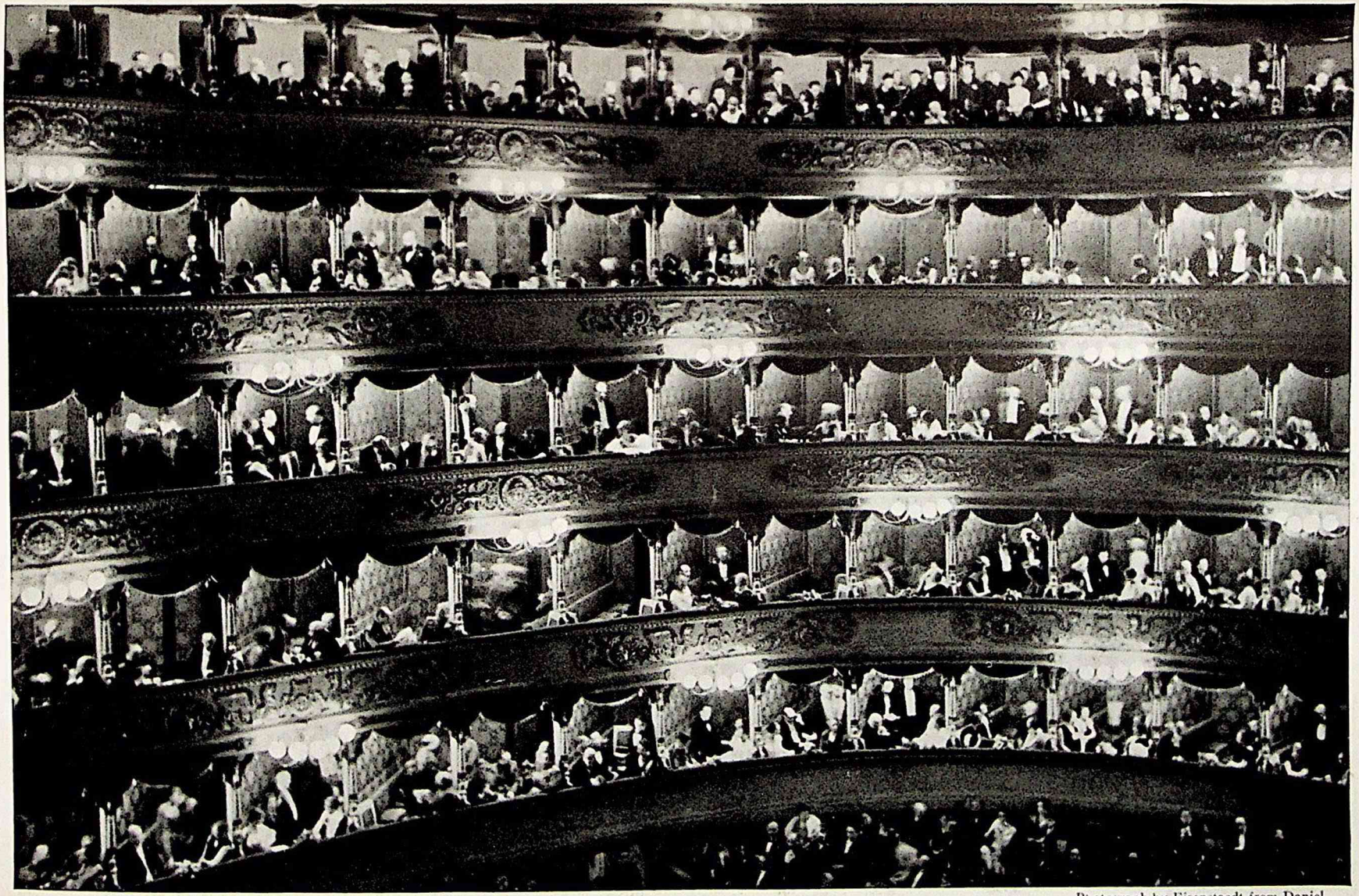
Looking from the National Monument (page 364) along the new Via dell' Impero toward the Coliseum, one gazes down on relics of the ancient city's public square and market place. Across the avenue is a forum, left, built by the Emperor Augustus. Historic edifices which once were pillaged by the Goths and Vandals must now be guarded to keep out souvenir-hunters!



Photograph from Ewing Galloway

SMOKE PLUMES FROM VESUVIUS, MIGHTY BACKDROP FOR THE BRIGHT BLUE BAY OF NAPLES

Italy's third city, Naples, spreads out along the curving shore line. The three round towers in the center are part of the Castel Nuovo (page 373). Across the bay and to the right in the distance are suburbs and the sites of Herculaneum and Pompeii, buried A.D. 79 by an eruption of the volcano. Excavations have revealed these ancient towns, showing exactly how the people lived nearly 1,900 years ago.



Photograph by Eisenstaedt from Daniel

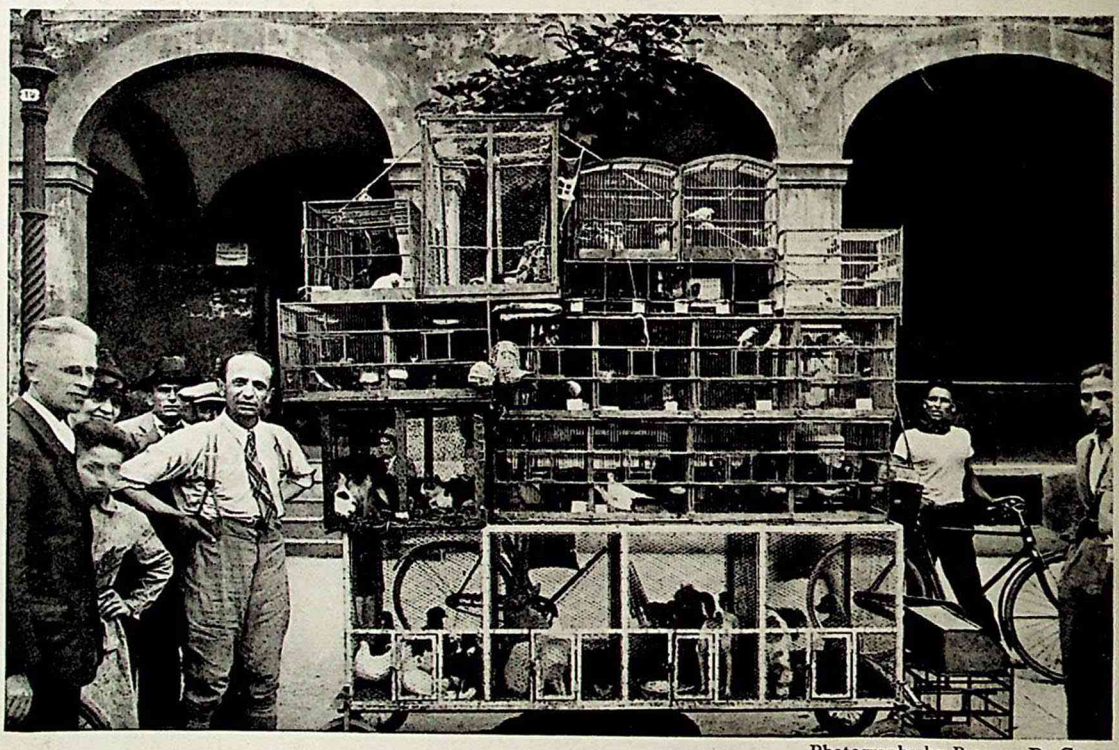
EVENING DRESS GLITTERS IN FOUR OUT OF FIVE TIERS OF BOXES IN MILAN'S TEATRO ALLA SCALA

Only in the highest rows are spectators ordinarily admitted without formal attire. Built in 1778, the huge theater has long been noted as an opera center.



MODERN ARCHITECTURE TRANSFORMS A PIAZZA IN ANCIENT BRESCIA

The new building with alternate blocks of light and dark stone is the Post and Telegraph office. Known to the Romans as Brixia, this thriving town at the foot of the Alps, between Milan and Verona, manufactures arms and automobiles.



Photographs by Branson De Cou

DOGS, CATS, PIGEONS, CHICKENS—TAKE YOUR PICK AT THIS PERAMBULATING PET SHOP

Like a Noah's Ark on wheels, the noisy establishment is pushed by its coatless proprietor through the streets of Bologna.

were kept perpetually at their studies. Now, no home lessons are permitted over the week-end. Saturday and Sunday are given up to state-organized sports, with time taken out on Sunday morning for Mass.

SIX-YEAR-OLDS IN UNIFORM

On these days all ages participate in sports and outdoor life of some sort. The youngest Italian sportsmen are the Figli della Lupa, or Sons of the Wolf. They are from six to eight years old (page 350).

In the first big parade held in Rome after the termination of the war in Africa, colored African troops marched with Italian army units, while a detachment of Figli della Lupa also participated, mounted on Sardinian donkeys which seemed little larger than a good-sized dog.

The girls from 6 to 14 are known as Piccole Italiane and wear a sort of white middy blouse, black skirt, and a black cap. At the ripe age of 14 they become Giovani Italiane, but retain the same costume.

When a boy outgrows the Figli della Lupa he becomes a Balilla until the age of 14 (page 356). From 14 to 18 he is a member of the Avanguardisti. In his eighteenth year, on April 21st—the day on which is celebrated the *Natale di Roma,* or birth of Rome—the Avanguardisti exchange their toy guns for real muskets and become Giovani Fascisti until they are 21.



© Donald McLeish

A FAIR GRAPE-PICKER AND HER MOTHER KNEEL BEFORE LOADED VINES

This hillside vineyard near Rome is on a patrician family's estate, one of the model agricultural establishments under Government supervision. Whole families toil in the fields at harvest time (page 367).

Italy, due to governmental encouragement, has become excessively sport conscious. The different cities have professional soccer football teams whose audiences vie with the English in faithful and enthusiastic attendance at games (p. 350).

One day in a Turin hotel room from which I could see nothing but a quiet side street, I heard a deafening uproar. To an ignorant foreigner it sounded as though half the population of Turin were receiving the castor-oil treatment from the other half. Investigation revealed that the tumult was occasioned by the victorious Turin football team arriving at the station and being greeted by the exuberant citizens.



Photograph by Branson De Cou

ONLY THREE ARCHES OF ROME'S BASILICA OF CONSTANTINE STILL STAND

Visitors seeking out this shady retreat on warm days find vagrant red poppies blooming among the ruins. Completed by Constantine the Great, the structure originally was more than 300 feet long and richly decorated. Eight Corinthian pillars once supported the roof of the nave, but the last of these was removed more than 300 years ago.

Skiing and all winter sports have captured the Italian mind, and Italy is drawing many visitors to her mountain resorts.

The ski enthusiasts are legion, and old, young, fat, and thin seize every opportunity to get to the mountains in the winter to glide and fall over their steep slopes. The Government does all in its power to stimulate this sport by offering greatly reduced train fares to the ski centers, while the Fascist gymnasiums have classes to teach young Italians the fundamentals of skiing and the art of falling down an alp without breaking a leg.

When the ski season is on, hundreds gather every Sunday morning, long before daybreak, in the candle-lit church of Santa Maria degli Angeli, which is in the Baths of Diocletian near the central railway station of Rome. There they assemble, skis on their shoulders, and hear Mass before departing for the near-by mountains of the Abruzzi.

These excursions are generally for the day only, as hotels in the Abruzzi are still of the simple type, and Italian snows are sometimes undependable—so much so that if skiers waited in hotels for snow to fall, they might wait a month.

Sestrières, in the Piedmont, 37 miles west of Turin, is one of the smart places for winter sports. Features of Sestrières are the new and modernistic hotels, tubular in shape (page 366).

One of the most popular resorts for foreigners as well as Italians is Cortina d'Ampezzo, encircled by some of the most spectacular peaks of the Dolomites. At other seasons of the year this is a mecca for mountain climbers. Within a short radius are mountain peaks of varying heights and inaccessibility sufficient to keep a tireless climber busy over a long period (p. 376).

Every spring Italian hearts are gladdened by a big automobile race—the Mille Miglia, or Thousand Mile. It begins at



Photograph by Bernard F. Rogers, Jr.

A GLASS-ROOFED ARCADE FOR SHOPPERS AND DINERS IN MILAN

Fine stores and cafes, with tables under awnings, line the Galleria Vittorio Emanuele II, a popular rendezvous. At one end the arcade leads to the Piazza della Scala, where stands the famous theater (p. 381); at the other to the Piazza del Duomo (p. 361).

Brescia in the north, goes south to the outskirts of Rome, across to the Adriatic, and finishes again at Brescia (map, page 353).

This is always run on a Sunday, rain or shine, up and down mountain passes and around right-angle turns which make the ordinary motorist on an ordinary day keep his finger on the horn and crawl around at a cautious pace.

If I remember rightly, the winning car in 1936 did the course in seventeen hours. Even if I am an hour wrong in my remembering, it was still a terrific speed (p. 372).

CROSSES MARK THE FATAL SPOTS

The thickest knots of spectators mass themselves at the worst corners, where they are in constant danger—if the slightest thing goes wrong—of witnessing their last race. The most desirable locations are embellished by crosses erected to defunct racers who made slight miscalculations at those particular spots.

The crosses, in addition to bearing the names of the unfortunates, state that they paid the supreme sacrifice in the Mille Miglia. To die charging an enemy machine-gun nest is no more glorious a finish, to the Italian mind, than to die in the Mille Miglia. The Italians overlook the fact that the fundamental reason for such races is to advertise tires, spark plugs, and motor oils.

The Italian newspapers, which are of modest size, carry scraps of world news, Government-dictated reports of what is happening nationally, columns about football, tennis, fencing, and other sporting events, and the endless activities of the Balillas and the other black-shirt organizations.

When it comes to writing up a motor race, such as the Mille Miglia, the correspondents give free rein to their emotions. The patriotic screaming of the American eagle is the soft, throaty, throbbing sound of a dove beside the symbolic bird of Italy.

Everything is superlative, rhapsodic—the roads, the scenery, the superiority of this race over any other motor race in any part of the world; the magnificence of the participating Italian cars, which have been improved with each passing year to attain perfection in spite of the "iniquitous sanctions"; their intrepid drivers; the unbounded enthusiasm of the spectators, which has reached heights never before witnessed in the history of man, all in spite of the "iniquitous sanctions."

Several cars were trying out a newly invented gasoline substitute, something of paramount importance in these days of the "iniquitous sanctions." Yet, in the final account of the race, I saw no mention of the use of the new fuel.

"HURRAH FOR MR. WAR"

The Italian enthusiasm for racing leads enthusiasts to daub the names of their favorite competitors on walls, on houses, on anything daubable. Thus, from south to north, one finds smeared the words VIVA GUERRA—Hurrah for War. Popeyed tourists view these words with silent distress, then return to their homes to report that all Italy is bursting with the war spirit.

Guerra, however, is a popular cyclist. The Italians were cheering for Mr. Guerra, not war!

During the American Revolution the Baroness Riedesel, traveling with her husband to defeat at Saratoga, reported that the Indians were shouting for war. What they were actually saying was "Waugh!" It sometimes pays to live in a country for a while before passing judgment on it.

A few years ago we began a motor trip at Rapallo, the beautiful coast resort a few miles east of Genoa, whose hilly, wooded terrain is thickly dotted with large hotels, villas, and pensions. Padua was the first night's objective on our way to Venice.

Distances on the map seem nothing; but wherever there are mountains the road becomes so circuitous that you soon feel like a person climbing an icy hill and slipping back a step for each two steps forward.

The progress of the first few hours was negligible owing to a mountain detour in order to avoid a landslide on the regular route. When we finally got back to the main road at Chiavari, we hastened to cross the square to draw up at a cafe for a pick-me-up of Fernet Branca.

Fernet Branca is a roan-colored liquid, which tastes to the uninitiated like one part mahogany juice and one part quinine. At a second trial it seems to be almost ninety per cent quinine and ten per cent hair tonic. On the third and subsequent trials it tastes like what the doctor ordered.

As we started to cross the square, several men waved us back. Since there seemed to be no reason for this officiousness, we decided to ignore it. Just as we were about to carry our point, a car dashed past like a shot from a gun. We had unwittingly chosen the route of the Mille Miglia for our first day's outing!

When it was safe to approach the cafe, we were in no state to question the taste of the Fernet Branca, and its medicinal qualities were doubly needed. For some hours afterward we proceeded at a cautious pace, looking backward more often than forward, always on the alert for another racer; and the corners were negotiated at the extreme right-hand edge of the road, with every finger crossed.

As we entered Padua, it appeared that all the Paduans were taking the air in the Piazza and the neighboring streets. The car was surrounded by them and we made signs to a man to draw closer to tell us where our hotel might be. He looked amazed, but drew no nearer. Just in time we realized that our motion to "come here" is the Italian sign for "good-bye." However, you can get a long way with the sign language, barring a few exceptions.

ZIGZAGGING OVER THE APENNINES

The following day we crossed what seemed like all the Apennines in the country. As the road zigzagged before us, ever upward and upward, we knew that when we reached the top we would be ravished by the sight of the lush, verdant lowlands below. From such a height the dim distance would reveal Venice and possibly the snow-covered peaks of the far-off Dolomites (page 358).

Instead, we saw more and more mountains, nothing but mountains, and it seemed more than probable that the road we were on was going the length of them instead of across where we wished to go.

No car ever passed us in either direction, nor was there any sign of life until, at the top, the rocky peaks turned into a group of small stone residences, huddled one against another, with an isolated stone

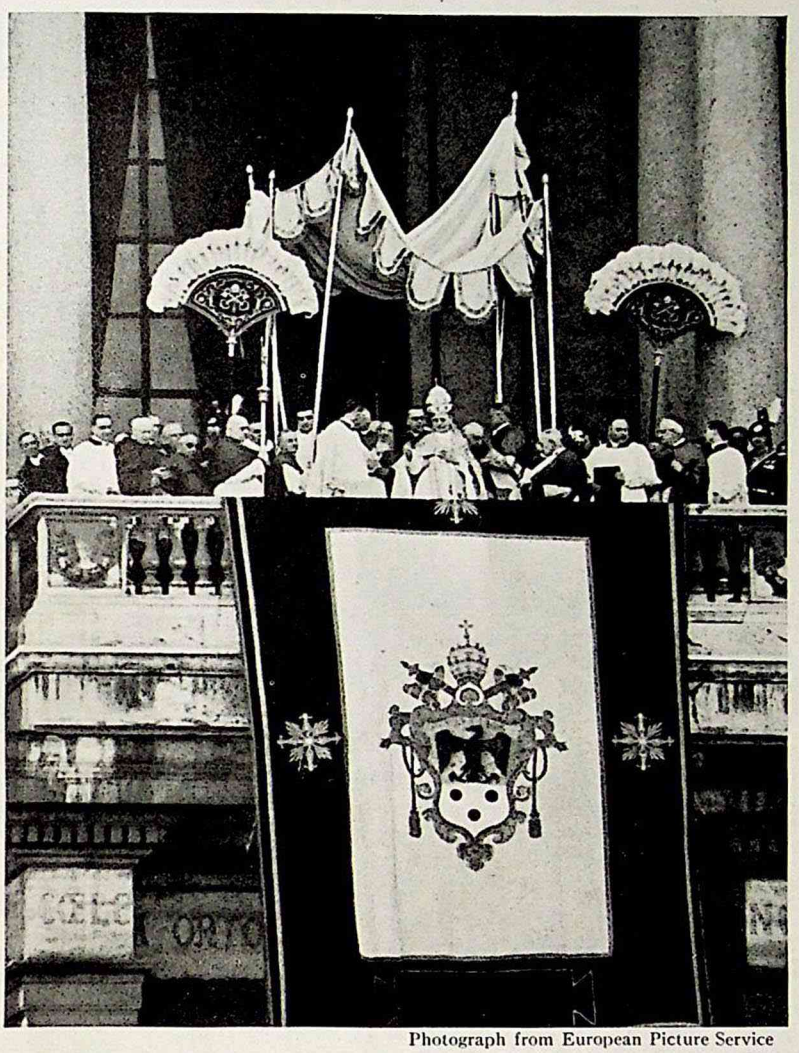
building standing bleakly aloof. This was the cafe and general store.

The one other customer was undoubtedly the traveled Beau Brummell of the Apennines. He was dressed in a bright reddish-brown striped suit with several watch chains strung across his vest, and he increased his standing with the proprietor by addressing us in English. He knew Americans when he saw them and could speak their language.

"You want veesky? Americans — veesky? Veesky—gin?"

This, repeated several times, quite stupefied the proprietor, who had command of only his own language. Even that, seemingly, had left him for the nonce. As for the Americans, they may have wanted veesky, but what they got was vermouth!

When the last of the Apennines was finally topped, the long-looked-for plains stretched temptingly below us and we zigzagged down into what Oman, the historian of our high-school days, called the soft warm haze of an early Italian summer.



Photograph from European Picture Service

POPE PIUS XI BLESSES THE MULTITUDE ATTENDING MASS AT THE LATERAN CHURCH, ROME

The tapestry in the foreground is displayed when the present head of the Catholic Church speaks in public. The tiara and crossed keys are the papal emblems, but the shield displays the personal arms of Pius XI.

A FREEZING FOG IN "SUNNY ITALY"

A section of Italy that motorists learn to shun is the valley of the Po in the winter. We left Trieste at noon on a warm, brilliantly sunny day late in December, intending to spend the night in Bologna. Around four in the afternoon we reached Rovigo, a mere 50 miles from Bologna (map, p. 353).

As we began to look forward to a comfortable room and a good dinner in an excellent hotel, a misty dampness swept past the windshield. The sky overhead was the famed Italian blue, only a little blemished by low-lying filmy wisps of fog. The wisps flowed together to become a veil, the blue of the sky turned gray, and in a few minutes we traveled in a cottony dusk.

Teams, pedestrians, and bicyclists were undiscernible until we were upon them. At one side of the road the lighted upper windows of a house appeared to swim in mist like a head without a body. The only way to be sure we were following the road was to follow the tail-light of another car. The one drawback to this was that the car might be heading for some place that would have no interest for us.

After twenty miles of this, we reached Ferrara and it was deemed advisable to stop for the night unless we wished to stop permanently in an Italian ditch. There we learned that such fogs as that through which we had passed are almost perpetual in the valley of the Po during the winter months.

The next morning, when we went on, the fog was like lemon sherbet. It froze on the windshield and had to be scraped off with a knife. Not until we lowered the windshield could we see to drive, and not until we emerged from the valley of the Po onto the high land near Bologna were we free of this clinging, penetrating, woolly, icy fog. Why all the inhabitants are not twisted with rheumatism, racked by tuberculosis, and covered with moss is an unsolved mystery.

Christmas Day, two days later, was sunny and warm in Florence—a day to dream about. The streets were black with Florentines strolling leisurely up and down, exchanging Christmas greetings, and filling the cafes for their noonday aperitif. A favorite aperitif of Florentines is known as an "Americano." It is blood red in color and made from a noxious, bitter-sweet vermouth known as "Bitter Campari," diluted with soda water.

At any time during the past ten years, when you engaged an Italian in conversation about his native land, his first comment usually was that Italy is a poor country. It has only limited natural resources, he says; much coal, iron, and oil must be imported.

For some years after the World War, reparations coal came from Germany. That supply is now exhausted. With the imposition of sanctions and the imperative need of conserving every lira for the purchase of war materials for the Army, the price of coal became prohibitive.

WINE TURNED INTO ALCOHOL FOR MOTOR FUEL

As so seldom happens in such conditions, Italy enjoyed the mildest winter in many years. This was interpreted by the Italians as a sign that God was watching over them and their empty coal bins.

Among Italy's exports, which made possible her imports, were wine, olive oil, and emigrants. Prohibition in America, coupled with world-wide depression, raised havoc with her wine trade. Wine from the Island of Elba is a case in point. The price for a liter, or about a quart, fell from four lire to fifty centesimi—from 32 cents to 4 cents.

Hopes raised by a thirstier and slightly more prosperous America were abruptly offset by the cessation of revenue from the sanctionist countries, England in particular.

The alternative was to turn the wine into alcohol with which to dilute the gasoline. Italian gasoline, in the spring of 1936, was 48 per cent alcohol.

The United States immigration laws diminished the flow of vast sums which poured into Italy yearly from her sons who made a good living in America. Some needed only a fraction of their earnings for their living needs and so sent the rest home; others saved and in many cases returned to the homeland to live in comfort on their ancestral acre.

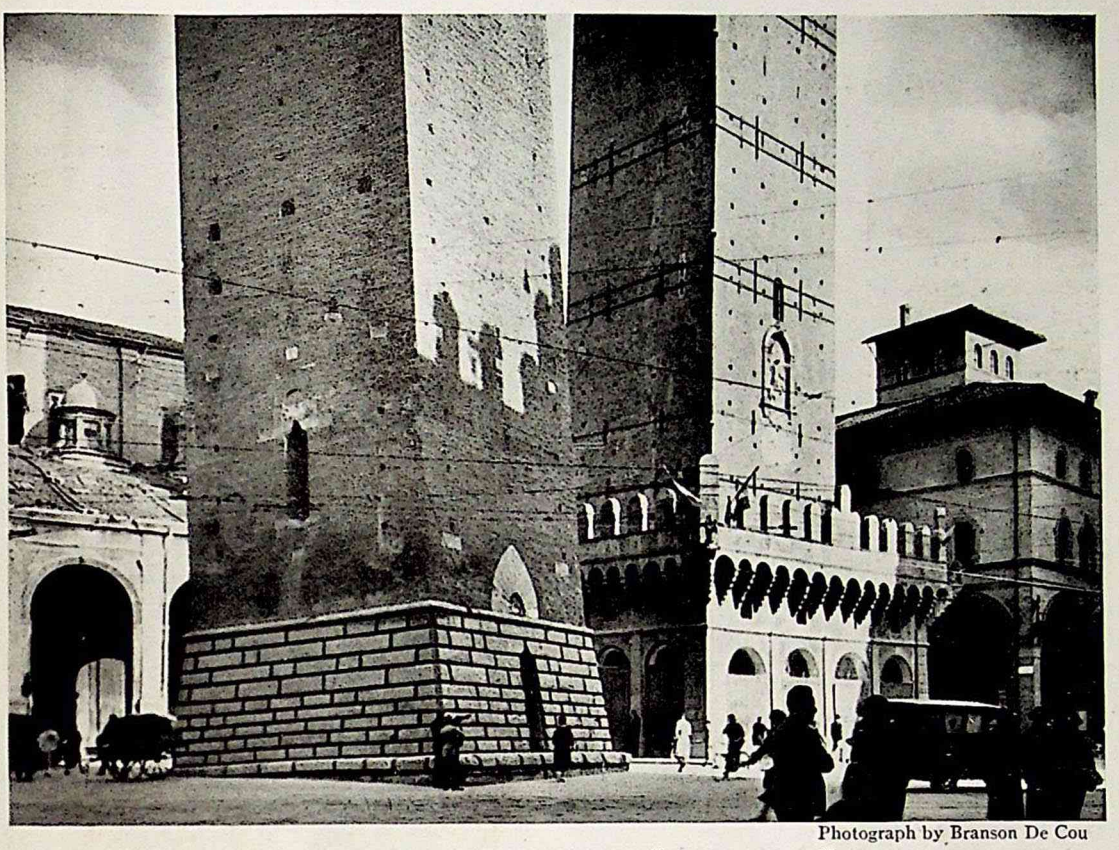
Three of Italy's resources which cannot be taken from her are water power, scenery, and art. About the only people who can keep warm, clothed, and nourished on art are a few guides, and the guards of the museums. The last few years their pickings have been meager, but if Europe remains calm their prospects look rosier than in many another occupation.

The accredited guide works as hard as many a man who is working for his Ph.D., and when he has once become a guide his labors are by no means over. Each year he must pass a severe examination proving that he is completely up on his subjects. These he must be able to expound clearly, intelligently, and in detail in three languages at least.

A young guide in Naples who knew everything, past, present, and future, that was to be known about Pompeii and Herculaneum is obliged this year to become as well versed in everything that pertains to the ruins of Cumae. He had spent two years in England, spoke English with ease, and was equally at home in German.

Owing to the unlimited supply of water power, the majority of romantic-looking but miserable villages have electrically lighted streets and electric lights in the homes. Electrically propelled trains now run through many of the long and perpetually recurring tunnels.

Italy has successfully inaugurated a boon to mankind which other countries are attempting to duplicate. This is the complete cessation of the blowing of motor horns within the limits of some Italian cities. For two years, as far as horns are concerned, these cities have been enveloped in a deathlike hush.



Photograph by Branson De Cou

BOLOGNA'S LEANING TOWERS HAVE BEEN HER "TRADE-MARK" FOR MORE THAN 825 YEARS

Dante compared the stooping giant Antaeus (Inferno, XXXI, 136) with the 163-foot Torre Garisenda, left, which slants 10 feet out of the perpendicular. The Torre degli Asinelli, 320 feet high but tilting only four feet, has steps leading to the top. Some say that the brick structures were built to lean; others believe that the soil subsided.

The Excelsior Hotel in Naples is a familiar landmark situated on the corner of the large water-front boulevard facing ever-smoking Vesuvius. Bedrooms have balconies from which can be seen ocean liners coming in to tie up at their piers or passing out through the breakwater on their way to the four corners of the world, tireless Neapolitan fishermen dipping their nets close to shore for the seafood so popular in Italy, and the coast line curving out to Sorrento. A stream of motors was constantly passing and honking. This was well enough in the daytime, but it was destructive to a night's rest.

Until two years ago the Italians, like the French, seemed unable to drive an automobile unless one hand was squeezing the horn. Now one sleeps at the Excelsior as well as in the heart of the country. It is claimed that there are fewer accidents than formerly.

At first it is nerve-racking for a foreigner to drive under these conditions, and visitors are not rebuked for gently tapping their horns. The licenses on their cars show very plainly that they are paying guests in the country and slight infringements are overlooked.

There is a horrid fascination in watching noiseless motor traffic. A motor glides silently up behind several sauntering, absent-minded pedestrians. The pedestrians continue to saunter, the car slows up and is finally on their very heels. Not until they feel the warm breath of the engine on their necks do they glance around and step to one side.

It is a pleasure to walk in the Corso and in the other narrow streets in Rome, where nerves are no longer frazzled by the former bedlam and where conversation is now possible instead of being a pain in the throat.

Italy's scenery, like her art, is a resource



Photograph by Branson De Cou from Galloway

NO FEUDAL CASTLE, BUT A MODERN HYDROELECTRIC PLANT ON THE LAKE OF GARDA

From the Lake of Ledro, high above, water rushes through twin penstocks down the steep hillside to turn dynamos capable of generating 20,000 horsepower. Behind the rowboats are some of the two-masted fishing and cargo craft that ply this largest Italian lake.

that is as enduring as the ages and the former is as varied and soul-satisfying as the latter. Both are always at hand.

People arriving in Italy from the north gaze in awe at the bemazing beauty of the Milan Cathedral with its countless pinnacles and lacelike fretwork (p. 361), see Leonardo's movingly tragic "Last Supper," and in a short space of time find themselves at Como, the gateway to those gems of the Italian lakes—Como, Lugano, and Maggiore.

The cares of the world are left irrevocably behind as one wanders beside their beautiful shores. They are close together. After a sail on Como, a few miles by train takes one to Lugano, and in the same way one continues on to Lake Maggiore.

Most people spend only a few days among these scenic glories, and wherever they linger longest that place remains forever in their minds as the beauty spot of the entire region. For that reason, for me, Lugano has no peer. It is the smallest and most exquisite of these three lakes, its smallness accentuated by the towering mountains that encircle it.

Each and every place has its loyal and ardent adherents. Como was the choice of Scotti whenever he had time to rest from his arduous duties with the Metropolitan Opera Company; and when he retired it was there that he went to live.

Lake of Garda, the largest of all the Italian lakes, offers more diversified scenery—wild and rugged in the north, changing in the south to pleasant hills with vineyards, olive, lemon, and orange groves. It is at



© Donald McLeish

VENICE'S WINGED LION OF ST. MARK PERCHES ON A COLUMN OVERLOOKING GONDOLAS AND WARSHIPS

The bronze image may be of ancient Assyrian origin, but the wings are modern. Napoleon took the lion and the four bronze horses of St. Mark's Cathedral (page 393) to Paris, the treasures being returned after the Battle of Waterloo in 1815. Near this terrace of the Old Library is a corner of the Doges' Palace, left.

Lake of Garda that D'Annunzio, Italy's gifted son and occasional thorn in the flesh, lives in royal and capricious isolation on a large estate which he acquired after the war.

SMALL FARMER IS BACKBONE OF ITALY

It is apparent to anyone who has traveled over even a quarter of Italy why the mass of the population must toil from sunup to sundown to wrest from the earth a bare subsistence. Thousands of miles are taken up by imposing mountain ranges, grandiose, magnificent to the eye, but many of them treeless, barren, and good only for winter sports.

If it were not for the rapidly increasing population, the American immigration laws of a few years ago which closed the door to many Italians, and the present government policy forbidding Italians to leave the country except for the best of reasons, the lot of the peasant would be perfectly endurable according to his lights. This would be a standard of life unthinkable to most Americans.

The Italian peasant, backbone of Italy, sees few newspapers and no magazines, barring an occasional seed catalogue. What Italian magazines there may be would only make his sleep the sounder. They would be almost devoid of the advertisements which fill American magazines and show that life cannot be lived without an automobile, an electric ice chest, an electric egg beater, an electric razor, and a thousand and one other things.

A radio not only is not a necessity to these people, but a radio at a public fountain, where forty or fifty women gather to do their family washing, would interfere with retailing of gossip, of which there is an inexhaustible supply. The movies and the lovelife of movie actors and actresses mean little to them.

Unless prevented by the weather, the men work on their pieces of land. Their day usually begins shortly after sunrise. At nine they knock off for breakfast, which may consist of a piece of bread with a wedge of cheese, or a chunk of raw bacon, or some freshly pulled garlic. If you are passing by at this time, you will probably receive a cheery good morning and the offer to share their repast.

Some farmers add a touch of sport to the day's work by carrying a gun with them. Game is plentiful, although extraordinarily wary, but if a hunter bags a *tordo,* the European robin, or a few sparrows, his evening meal is pleasantly varied. No bird, be it quail, lark, or thrush, is safe if his aim is good.

LIFE OF LABOR BEGINS EARLY

The life of the family is of paramount interest and all the children, boys and girls alike, assist their parents in the home or on the land as soon as they are old enough to do so.

The farmer who has charge of our Italian home needed assistance last winter. He hired the son of our neighbor, Romeo, for 8 lire a day (about 63 cents). The boy was a skinny child, 11 years old. He swung a full-sized two-pronged Italian mattock eight hours a day for five days and turned up a field and six terraces—a total of two acres—to the depth of a foot. We saw him doing a similar stint on his father's property a few days later.

Five-year-old Italian children toddle out to the vineyards with their fathers and phlegmatically swing toy mattocks for amusement.

The duty of caring for a younger brother or sister begins at a tender age. In many peasant homes baby carriages are unknown. Little girls, small enough themselves to be carried across a muddy street, hold and carry smaller children hour on end. These are their dolls.

The little girls love to jump rope. Two girls will swing a long rope for others to jump and it is no uncommon sight to see a child of eight or ten, with a baby clasped tightly in her arms, run under the swinging rope and jump as blithely as those who are unencumbered.

Thriftiness is a national virtue as well as a necessity. The parents rejoice in a large family and save money diligently for the day when the children will marry. The whim of a moment does not at once culminate in marriage. The parents of the participating parties give the matter serious thought, for neither party can come empty-handed.

Early in life the girls begin to accumulate their linen, much of which is elaborately embroidered. As a rule, the man provides the furniture, the chief item being the bedroom set. If you should call upon a newly married couple you would be astonished by the completeness of this room.

Most important of its furnishings is the *letto matrimoniale,* or nuptial bed, shiny, huge, and imposing, which before long will accommodate three people at least. This is always flanked by two night tables, and in addition there is a large *armadio,* or cupboard—instead of closets, which are nonexistent in Italian houses—a bureau, and several chairs. These are the vital articles which endure for a lifetime.

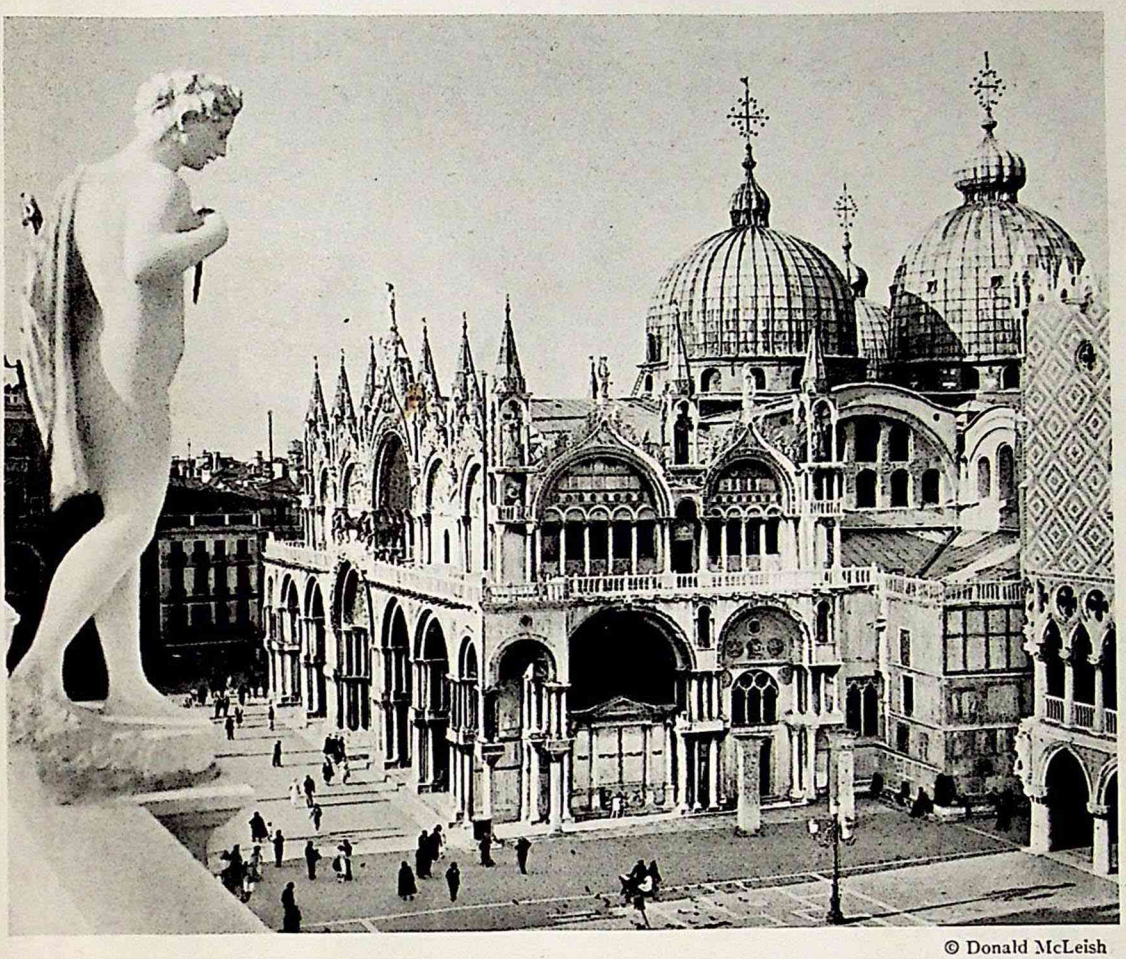
Those who can afford it may have a dining room in addition to the kitchen, the all-important article being a china cabinet.

We called on a bride and groom who had set up housekeeping in a tiny three-roomed cottage high up on a hillside. They were the proud possessors of a bedroom, dining room, and kitchen. The place was spotlessly clean, yet every drop of water had to be brought in picturesque copper jugs from a picturesque fountain a distance of three hundred unpicturesque yards down the hill.

A former cook of ours became engaged. Her wages had made her the moneyed member of her family. Over a period of years she had accumulated the necessary linen, but it was considered her privilege and duty to supply the mattress for the new home. This was a matter that loomed large, for a mattress cost two hundred lire, at that time the equivalent of ten dollars.

The wedding day is a big occasion, as it should be, since the memory of this festive event will be the brightest and most carefree moment that the young couple will ever experience.

This begins in the morning with the



© Donald McLeish

TRADITION SAYS MARK THE EVANGELIST, PATRON OF VENICE, RESTS IN THE CATHEDRAL BEARING HIS NAME

Passers-by feed pigeons in the spacious Piazza below a statue of Diana standing on the Old Library terrace. The celebrated bronze horses are above the main entrance of the lavishly ornamented 11th-century Cathedral. In the Doges' Palace, right, lived the rulers of the old Republic of Venice.

church wedding. The mother of the bride is seldom present. She is busy at home preparing the wedding banquet.

Every room but the kitchen is stripped of furniture, chairs line the walls, and before them long boards are placed on trestles as tables. These are dressed in their best, and after the ceremony all repair to the bride's home for a glass of wine and some very light refreshment. Then the bride and groom and all their friends go for a walk while the tables are cleared and freshened and the serious business of preparing them for the wedding feast gets under way.

No celebration is complete without the throwing of confetti. Italian confetti consists of varicolored, candied almonds, exactly the same candied almonds that are sold in candy shops in America, delightful for eating, but almost as dangerous for throwing purposes as the dread Irish confetti!

The customary wedding journey is to the new home. In recent years some have availed themselves of a trip to Rome, for the Government offers railway fares at a reduction of 80 per cent to all brides and grooms who wish to honeymoon in the Eternal City.

The layette for the first baby is no less elaborate and complete than the supply of linen which the bride has brought to her new home. The reason for this is that one layette does for all future progeny.

Italian babies are still bound in *fascie* as were the Luca della Robbia babies of



Photograph by Branson De Cou

LACKING COAL AND FUEL OILS, ITALY HAS ABUNDANT "WHITE COAL"

Here a modern power plant on a tributary of the Adige River, in the Alps, contrasts with a turreted castle that dominates the hillside. Italian industry depends heavily upon water-generated electric power, distributed over wide areas by a network of high-tension wires (pages 388 and 390).

old. A fascia is a stout piece of grosgrain material a foot wide and three yards long. The child is wrapped tightly in this from its underarms down, as in a cocoon, and is unwound two or three times a day. This simplifies the carrying of a baby, for there can be no wriggling. Only the head and arms are free, which minimizes the dangers resultant from being dropped by the sub-adolescent nursemaids.

The only article in a baby's layette which needs replenishing for subsequent children is a knitted jacket. This is not necessary for the child's well-being, but for the mother's gratification when she walks with the child for pleasure. The jacket presents a *bella figura*—a good impression.

"CHARGE IT" SELDOM HEARD IN ITALY

Husbands with extravagant wives would heartily endorse a practically universal custom in Italy—the absence of charge accounts. What is bought is paid for on the spot or on delivery.

After a transaction is closed, it will cause only grief if you should change your mind. It might be possible to change the article for something of like value, but to return the article in the hopes of getting your money back would be out of the question.

Any money that has entered the till is considered a sacred trust by the average Italian shopkeeper. He is perfectly willing to wave his arms and work himself into a verbal frenzy of argument; but all arguments are useless. Never a soldo is permitted to leave the cash drawer.

Patients who are taking protracted cures or treatments receive bills. All office calls are supposed to be paid for before leaving.

There is one trying trait displayed toward foreigners by Italian servants and workmen. You may want someone to do something for you, some slight accommodation that requires only a little labor.

Foreigners are expected, naturally, to pay for all favors; but when they ask how much they owe, the answer is generally, "Ah,



Photograph by Branson De Cou

IN AND OUT OF TUNNELS WEAVES THE NEW HIGHWAY ALONG THE LAKE OF GARDA

A lemon vender nonchalantly blocks the road where it emerges after winding through what was once solid rock rising from the lake shore. This marvel of engineering suggests the Columbia River Highway, in Oregon.

what you wish, madam!" The unfortunate outcome is that the person who has done the favor is often paid too little or too much; there is a great deal of unnecessary conversation, and someone is usually left with an unpleasant taste in his mouth.

Another Italian trait, even more widespread than thriftiness, is patience. This has been acquired from time immemorial because of the utter futility of giving way to impatience. Impatience, Italians have discovered, results in nothing but indigestion.

SOLDIERS GUARD THE ROUTE OF THE ROYAL TRAIN

One beautiful spring morning we left our winter home to go by motor to Rome, about a hundred miles distant, where we had reservations on the noon train for Naples. The boât for America was sailing the following day. We had allowed ourselves ample time in the hope of seeing the new Via dell' Impero and other recent changes in Rome before settling ourselves in the train.

A few miles from our home, where the highway crosses the main line of the railroad, we found the gates down. Soldiers were stationed at the crossing and along the tracks, with their backs to the rails and facing the countryside, and with rifles on their shoulders. A few carts, bicyclists, and pedestrians had gathered at the gates.

After waiting a few minutes and seeing empty tracks in both directions, we made inquiries and were told that the Royal train was on its way south.

The train was still twenty-five minutes away. We protested to the guard who was facing us. Nothing could be simpler or more harmless than to raise the gates and let us pass! We had a train to catch in Rome! It was ridiculous not to let us through!

He was adamant and said that had the crossing not been equipped with gates, still we could not have been permitted to proceed. In due time the Royal train shot by, all windows closely curtained.

Thirty-five miles farther along is the city of Civitavecchia, where the road again crosses the railroad. There we waited another fifteen minutes for the same reason. When the Royal train had once more thundered by, our ample time allowance had become scarcely adequate, all hope of seeing the Via dell' Impero was ended, and our one desire was to make the train. This we did with three minutes to spare. One must allow for more than punctured tires and acts of God when traveling in Italy.

Another time American tempers were sorely tried. We had decided to see if we could find in the Civitavecchia markets a few delicacies that our small town could not supply. As we approached the picturesque town of Montalto di Castro, we saw the road curving up a steep hill. A soldier waved a red flag at us, making signs that we were to remain at the bottom. We could see that half the road was torn up, but that was all we could see.

After cooling the engine for fifteen minutes, the American gentleman chauffeur was convinced that we were being detained for a mere whim and, red flag or no red flag, started up the hill. When we reached the bend we saw a truck blocking the entire road while it dumped rocks and earth into the part under construction.

We slipped back to our former place and waited another fifteen minutes. At the end of that time, the sputterings again grew violent. In America, for a fraction of that time, the annoyed traffic would have made life hideous with its horns!

I looked behind us. In half an hour Italy's No. 1 highway had become choked with one truck and one donkey cart!

When we reached home and our purchases were unpacked, one article was a fish, though fishing is the main industry of our village; another was a vegetable unknown to us, which promised a pleasing change. The cook said, "But, signora, this is growing in our own garden!"

THE RISE OF IL DUCE

The first few years after the March on Rome in 1922, Mussolini was acclaimed as the Nation's savior. His was an iron hand in a glove of steel, but all classes felt he had saved them from things that might have been worse. A few years later there were rumblings of discontent, but these rumblings rumbled only in sympathetic surroundings.

Then the names "Mr. Smith" and "Our Uncle" came into use if one wished to refer to Il Duce. A year later one could not be in a retired corner with a certain class of Italians without having an endless stream of anecdotes about Mr. Smith, Our Uncle, and Our Uncle's Satellites poured into one's ears, exactly like the outpouring of Ford jokes that filled the United States at one time.

Many men of standing, in the beginning, never wore the Fascist insignia. Though they were members of the Fascist organization, they felt their reputation as admirable members of Italian society for generations was self-evident and the wearing of a pin was not necessary to prove it. With the passing of time the steely glove became steelier and the pins were put on. Today the lesser officials and many others of that class would be mistaken in America for popular high-school students.

REGIME STRENGTHENED BY AFRICAN WAR

Since the Fascist regime came into power, something spectacular happening from time to time has kept the people excited and enthused over the returning greatness of Italy—kept them from brooding over increased taxation. When Balbo and his armada of seaplanes made the successful flight to South America and back, the country went wild (page 354).

Balbo's flight to the Chicago "Century of Progress," the winning of the blue ribbon for the fastest crossing of the Atlantic by the *Rex*, the draining of the Pontine Marshes and transforming them into farms and towns, kept enthusiasm going at a slower rate, while taxation continued increasing.

The war in Ethiopia, it is said, was for Mussolini a case of sink or swim. The Italian victories would have assured him a warm and loyal place in the Italian hearts; but when those Italian victories were achieved in the face of bitter opposition from the League of Nations—which to Italy means England, the first power in the world—Mussolini, in Italian eyes, became almost a god. Never in the early days had his popularity compared to what it was at the end of the African war (p. 355).

When celebrations were held for Marshal Badoglio, the hero of the war, there would have been no heart burnings if they had continued indefinitely; for Il Duce's star was supreme.

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TURBULENT SPAIN

BY RUTH Q. MCBRIDE

CIVIL war in Spain signalizes again the startling changes which have swept that ancient land in recent years.

In the swift rush of daily news, more is said of military leaders and their campaigns, of statesmen and changing governments, than of the deep social and economic transformations behind the news, or the character of this land and its people.

Long before King Alfonso fled, these changes were of course under way, and because of them his monarchy failed.

Since 1922, when I first went to Spain to live, these transitions have gathered momentum, until today this once romantic land of duennas, monasteries, bullfights, and leisurely pastoral life has written a new and dramatic chapter in its long history.

Where centuries-old country lanes and mountain trails used to wind, fine new concrete roads now streak over the hills. To a large degree, men have exchanged their saddle mules for flivvers, and the high-wheeled, clumsy oxcart yields to the whizzing motor truck.

From the Bay of Biscay down to the blue Mediterranean, traditional peasant costumes are being discarded and men are dressing in plain blue overalls. Black-eyed señoritas today lay away the time-honored mantilla, get their hair bobbed, and hunt city jobs as typists, telephone girls, and shop clerks, as do their sisters in many lands.

New thinking as well as new machines change the way of Spanish life. Bullfighting still goes on, but now the intrepid toreadors belong to a labor union! You may still find guitars and fandangos, for Spaniards are ever a music-loving people, and possibly you may find here and there a lovesick couple mooning at each other through an old iron-barred window. More and more, however, the radio supersedes the guitar and the girl has come out from behind the historic grillwork and gone to the movies with her sweetheart—or to the street barricades to fight with him! (Page 413.)

One fact to grasp, in understanding the social muddle here, is that Spain is divided into 50 provinces; and not so many years ago it was commonly said that it also had 50 different national dances and costumes, together with almost as many dialects. Here is an incident full of light:

With some Catalan friends I was going through one of Barcelona's big textile mills —whose 60,000 looms turn Dixie cotton into cloth for all Spain—when some one suggested a further trip next day.

"But I can't go," said a Barcelona companion. "Tomorrow I must go abroad to Madrid!"

Such strong ties with home locality, rather than any intense national adherence, are typical of Spanish provincialism.

MAÑANA LAND QUICKENS ITS PACE

Comparatively sudden advent of new high-speed roads, faster vehicles, speeches and news broadcast by air, and the breakdown of church influence, all combine now to dissipate this old conservative provincial spirit. Thus has Spain been turned into a milling, restless land. For the first time country and town life are freely blended, and the peasant can hear the exciting talk



© Delius from Stephen Swift and Associates

WHITEWASHERS PAUSE TO CHAT ON A BARCELONA STREET

Even during a lunch-hour stroll, they carry the long brushes which enable them to whitewash a one-story house without using a ladder.

of city radicals and revolutionaries that yesteryear came only as a remote murmur.

Spain is now becoming so modernized that busses of every kind and color race along from village to village, from town to city. Till a few years ago, many country people never journeyed more than 20 miles from home in their lives. Now by cheap, or even free, rides in war times, they travel all over the country!

With the rise of the Republic came, of course, more liberty of speech and action; but, born of the 50 provinces and their 50 different ways of thinking, came also wide division of opinion and action.

Political parties of all shades sprang up in great variety and number. Certain factions held that progress should be attained gradually through education of the masses — masses as yet untrained in the art of government. This is obviously a slow process and one would suppose that in a romantic "land of mañana" a slow process would be acceptable.

But the mañana idea is another of those old Spanish customs so rapidly disappearing; many now demand a quicker approach, a faster progress.

CHANGES MOST APPARENT IN THE CITIES

Thus a peek at Spain of today reveals a startling modernity of thought, civilization, and up-to-the-minute comforts and contrivances, superimposed upon the stubborn survival of many local ways and prejudices that bend or break but slowly.

Irresistibly, however, the cities put on a more modern dress and quicken their pace. Consider, hastily, some of the cities and towns figuring so lately in the news.

Take a look at Barcelona, the New York of Spain. It is the largest city in the country, the most important financial and industrial center, and by far the busiest seaport (map, pages 402-3).*

* See "Barcelona, Pride of the Catalans," by Harriet Chalmers Adams, in the NATIONAL GEOGRAPHIC MAGAZINE for March, 1929.

The sun shone in air crisp and exhilarating as we strolled down the Paseo de Gracia, Barcelona's most important thoroughfare and indeed one of the most interesting and modernistic streets in the world. Fine motorcars (no trucks allowed on this wide avenue) stop and go at modern American traffic signals.

At the foot of the Paseo is the very heart of Barcelona — the Plaza de Cataluña—a large open space filled with statues, fountains, flower beds, paved paths, and benches.

Always animated, human streams flow in and out of its subway entrances. The Plaza, too, is the center of fierce turmoil in every political upheaval. It is surrounded by large, ornate structures—banks, hotels, and a new telephone office building with copper-green tower, a Yankee skyscraper indeed in a Spanish metropolis!



Photograph by Talbot M. Brewer

FAMILIAR NAMES FLASH FROM A SPANISH NEWSSTAND

Blood-curdling covers advertise translations of American dime novels, which, like Hollywood's motion pictures, enjoy wide popularity in the land of Cervantes and Lope de Vega (page 405).

Flying at another corner is a welcome sight for American eyes—the Stars and Stripes—indicating the splendid offices of the United States Consulate General.

Big signs advertise American automobiles. Indeed, three-fourths of all cars in the Plaza are of familiar make. There is a large American bank a few doors up the street; in bookstores are displays of American fountain pens, and in the tobacco shops even chewing gum!

All these business houses use American adding machines and cash registers, and the offices hum with American typewriters. Many of the fine new apartment buildings are equipped with American doors and electric refrigerators. Here "foreign trade" is a pulsing thing far removed from the dry statistics of our commerce.

A RAMBLE ON THE RAMBLA

"Rambla" really means a dry ravine, but in Barcelona the word is used to designate a wider street or boulevard. The original fascinating Rambla of Barcelona is like no other thoroughfare in the world! It is a



Photograph from Wide World

WAR MAKES AN ARMED CAMP OF BARCELONA'S "GREAT WHITE WAY"

Barricades sprawl across the Paralelo, night-life center noted for bright lights, popular theaters, and cabarets (page 405). People of Catalonia, of which Barcelona is the chief city, have their own language and customs, differing from those in other parts of Spain. In 1932 Catalonia was made an autonomous region within the Spanish State, and it remained loyal with the outbreak of the 1936 revolution.



Photograph from European

CIVIL GUARDS UNPACK THEIR TIDY KITS

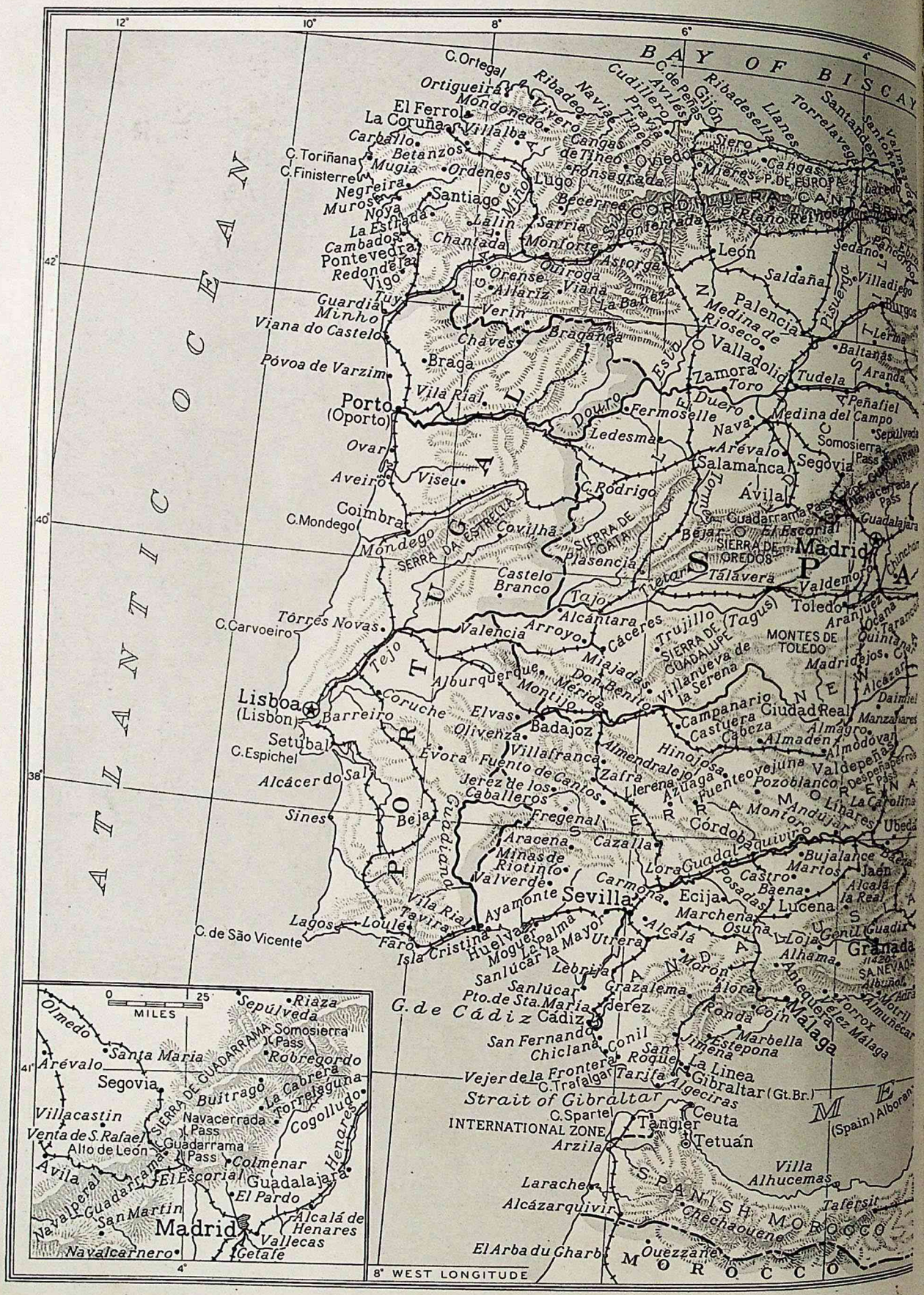
The lid of the nearer trooper's trunk bears a photograph of his mother or sweetheart. On the wall hang cartridge belts, sabers, stirrups, and other equipment, including the oddly shaped, white-edged dress helmets. This national police force split during the revolution, some of its members joining the rebels.



Photograph by Montana from Black Star

ON A FIESTA HORSE BUILT FOR TWO

The señorita seems to be exchanging animated banter with someone in the crowd, as she rides through Sevilla perched behind her gaily costumed escort. Dressed for a festival, she wears a large Andalusian comb, earrings, and voluminous, brightly colored skirt.



STARTING IN SPANISH MOROCCO, CIVIL WAR ENGULFED SPAIN FROM GIBRALTAR TO FRANCE

Drawn by Herbert E. Eastwood and Ralph E. McAleer

MADRID, NEAR THE CENTER OF THE COUNTRY, IS BARRICADED BY MOUNTAIN RANGES



Photograph by Suessmann from Pix

PALM TREES ADD A TROPICAL TOUCH TO ONE OF BARCELONA'S PLAZAS

Located in about the same latitude as Boston, Massachusetts, Spain's foremost seaport has a mild winter climate, with rarely any snow. "Unique in both beauty and situation," Cervantes' hero, Don Quixote, called Barcelona. A fountain surrounded by flower beds forms a symmetrical bull's-eye in this sunny plaza, lined with shady arcades and balconied apartments.

long, straight avenue with a wide promenade for pedestrians in the center and is lined with tall plane trees.

Busy stores flank the Rambla from end to end, interspersed with theaters, cinemas, an ancient church or two, and a large number of cafés. Under bright, wide awnings that canopy the sidewalks and shade the little tables, idlers sit and watch the lifeblood of the metropolis stream up and down its main artery — streaming at a much quicker tempo since recent shooting started!

Like the Paris boulevards, each section of the Rambla bears a different name. First come ornamental kiosks displaying an amazing variety of newspapers and magazines in every European language. Then comes the bird market. Arranged in cages of all sizes along the promenade is a bewildering show of yellow and brown canaries, gray parrots from western Africa, green ones from Brazil, tiny parakeets, all setting up a lively chatter.

The next section is the brightest of all—the Rambla de las Flores. Here open-air flower stalls, bossed by black-haired peasant women, offer flowers of every color and shade. Love of flowers is one point at least upon which all divergent political parties can agree!

Following the flower stalls come more kiosks where one may procure ice cream or soft drinks. Buildings begin to look older now—the New World gives way to the Old—and finally we come out into the wide water front, with its ornate customshouse, the tall statue to Columbus, and the palm-lined Paseo de Colón. To the right, in the shadow of the huge, somber stone barracks, is a long double line of second-hand bookstalls. Here I once found an English book of travel describing a voyage around South America, profusely illustrated, printed in 1707, a first edition, for two pesetas—about 25 cents at that time.

We asked the fat old proprietor of one of the stalls if he happened to have anything in English. He climbed upon a chair and pulled down an armful of books. Shaking off a cloud of dust, he went through the mass. Then he smiled and handed us two five-cent Buffalo Bill thrillers with colored paper covers so popular in youthful circles at home years ago. Buffalo Bill and Nick Carter's heroic adventures printed in Spanish are, incidentally, quite popular today and are on display (page 399).

At the next stall I bought an ancient parchment-covered book in Spanish, published in 1755, full of quaint woodcuts and describing in detail a number of sleight-of-hand tricks. I found many of them to be precisely the same tricks with cards and coins that our magicians entertain us with today.

Sloping up on the right of the harbor is the high hill of Montjuich, with a sinister old fort upon its crest. In turbulent days of riots and strikes, executions of ringleaders take place here.

Formerly the slope opposite the harbor tapered off into swamps and dumping grounds; today it is one of the most beautiful parts of Barcelona, transformed in a few years into lovely tree-lined terraces, ornamental buildings, fairylike cascades—the site of the international exposition of 1929.

Leading away from the exposition grounds is a wide street known as the "Paralelo," rather shoddy in daylight, but at night a blaze of electric signs announcing music halls, cafes, and night clubs—a gay street. Raquel Meller and other stars danced here before fame came to them—admission, two pesetas (page 400).

"THE MAN OF THE ROPE" IS NOT A HANGMAN

Not only here but in the ramblas one comes across that unique Catalan type, the *mozo de cuerda,* which, literally translated, means "the man of the rope." He is a public porter, long known by his red woolen "stocking cap," and over his shoulder he always carries a coil of rope. For a small fee he will run any errand or shoulder any article—from fish or flowers to a coffin.

Leading from the Rambla, tall houses flank narrow streets where the sidewalks are hardly wide enough for a fat man to walk in comfort. Tiny shops occupy the lower floor; one sells cheap dishes, another candles only. Then there are small, dark lace shops and a store handling bars of mottled green "castile" soap, made from the residue of olive oil.

Barcelona has well over a million people. Although it has grown rapidly in recent years, that growth has been gracefully and becomingly accomplished.

Guttural Catalan is heard on every side, but in shops and in offices they will speak Spanish if you insist.

Flags of all nations fly from steamers



Photograph by E. Kelen from European

EVERYTHING FROM A LOVE LETTER TO AN S O S CALL FOR MONEY IS WRITTEN TO ORDER BY BARCELONA'S PUBLIC SCRIBES

In these booths uneducated folk may dictate their correspondence for a small fee. Spain's percentage of illiteracy has been greatly reduced in the last ten years.

docked here. We watched one shoving off for Buenos Aires. Next to her was a new Spanish ship, the *Magallanes,* just in from New York, its interior decoration in typical Spanish style—carved oak, artistic iron lamps, dark furniture, red tapestries and drapes, and bright Valencian tiles around the floors and lower walls.

There were freighters from England, Italy, Norway, Germany; an oil boat carried the Soviet flag. Two larger cargo steamers flew the Stars and Stripes—one unloading cotton from Galveston, and the other from New York with a whole cargo of crated automobiles.

It was here, only a few weeks ago, that the American steamer *Exeter,* amid much danger and excitement, succeeded in evacuating some 160 Americans and other foreigners from the revolution-swept city.

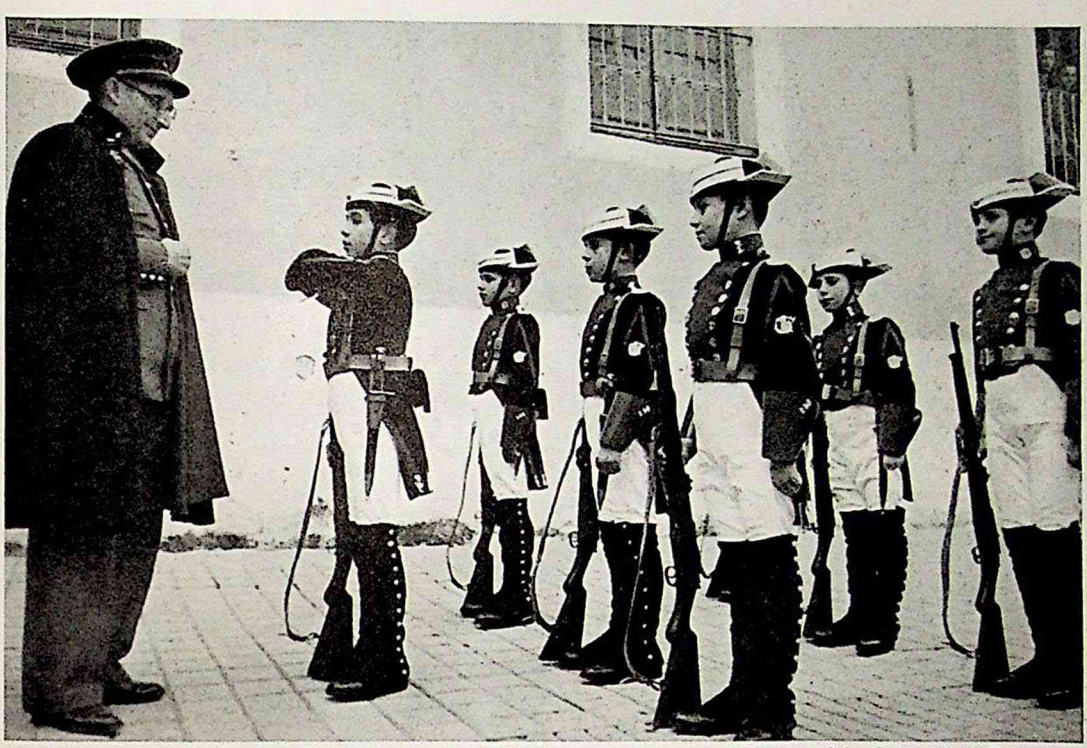
Out of Barcelona runs a fine motor highway toward Madrid. It winds among green hills thickly studded with little villages and truck gardens. Red-headed milestones appear along the roadside, marking the new motor arteries with the letters "C. N. de F. E." (Caminos Nacionales de Firmes Especiales) and the number of kilometers to Madrid—628, to be exact (390 miles)—merely a good day's run, if one is in a hurry.

Along the banks of the Llobregat, peasants work in flat bean fields, each plot separated from the other by hedges of blue-green prickly aloes. There is always an olive tree or two standing near them and a stone water tank in which the women wash clothes and hang them along the aloe hedge to dry.

Rocky Montserrat juts straight out of the rolling plain like a huge battleship, an isolated mountain bulk, one peak of which rises to a height of more than 4,000 feet.*

Coming to Igualada, we ran slowly down its main street, through this sepia-hued town built along the banks of the River Noya. Like most Catalan towns it is given over to industry. Here is located a large tannery, with hundreds of hides and skins hung to dry—like an unusually large and dirty weekly wash.

* See "Montserrat, Spain's Mountain Shrine," by E. John Long, in the NATIONAL GEOGRAPHIC MAGAZINE for January, 1933.



Photograph by Cohnitz from European

"ALL PRESENT, SIR!" REPORTS THE LITTLE CORPORAL

These orphans of Civil Guards wear colorful old-fashioned uniforms with helmets like those of their fathers' organization (page 401). Seven boys from the orphanage at Valdemoro, near Madrid, are chosen each year to march with the grown-up Civil Guards at reviews and state functions.

Small American automobiles darted about, painted in bright colors and marked Barcelona, Manresa, Villafranca, Cervera. How quickly this new means of travel has developed all over the Peninsula!

ALWAYS ROOM FOR ONE MORE ON A SPANISH BUS

Most of the little busses we passed on the road were overflowing with humanity, who hung on like flies.

To the south of the highway is Verdú, where, in April of each year, is held a famous mule fair. Catalan mules are world-renowned for size and strength; numbers have been shipped to our Midwest States despite Missouri's claim to prominence in this product. During the World War, Allied purchasing agents took whole trainloads to France for military work, and early graves.

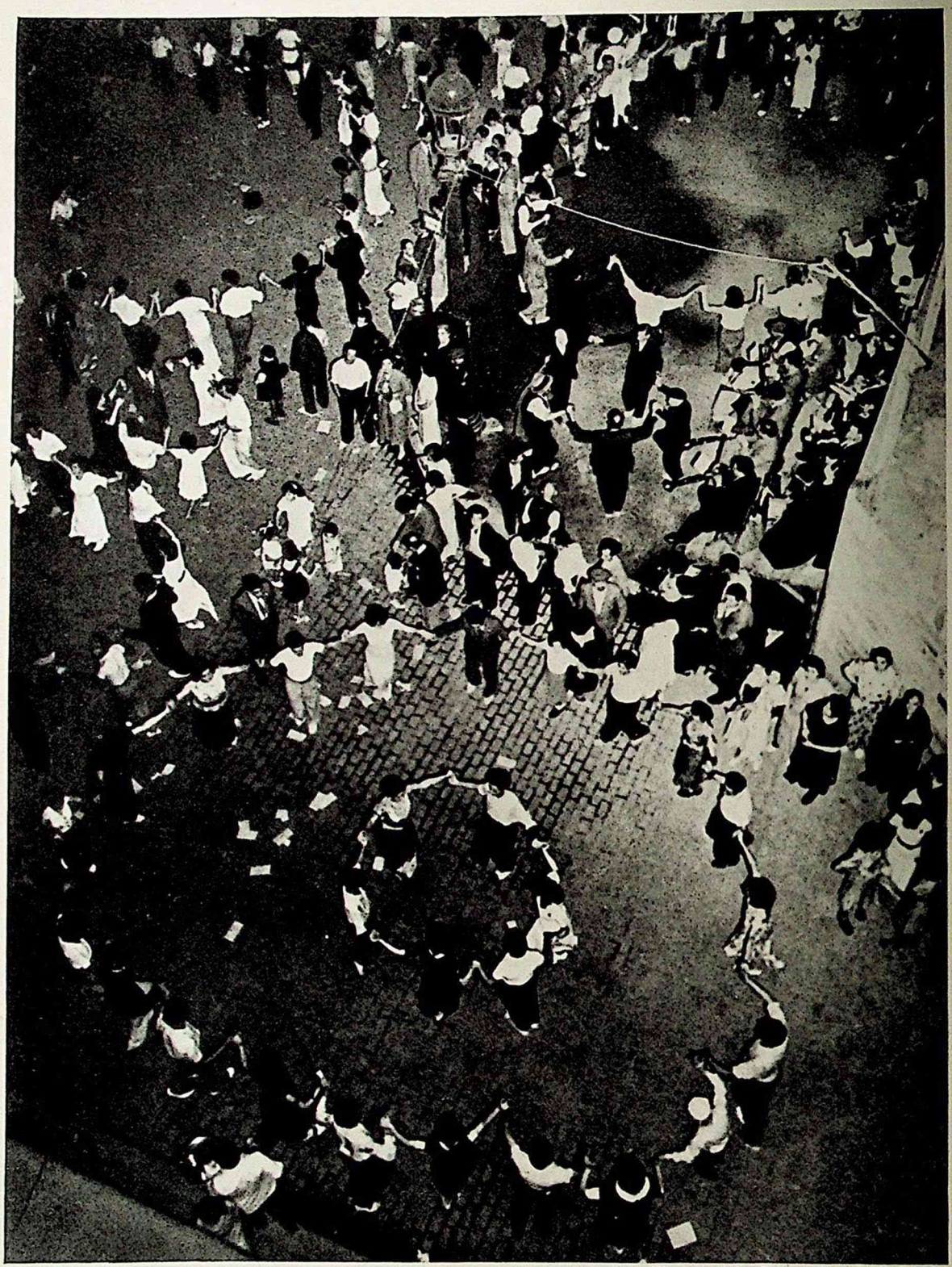
More and more the land became bleak and forbidding as we approached Aragon. Tiny villages along the way seemed drab, brown, and dull. In the distance Lérida came into view, its houses and church towers built upon the steep slope above the river. Along the crest stand its heavy defense ramparts, behind which are the red-brown walls and the tall octagonal tower of the Antigua (meaning "Old") Cathedral.

Lérida has always been a place of military importance; there is strategic value in its situation at the point where the vast plain of Aragon begins. The tall tower of the Old Cathedral may be seen for miles and is like a lighthouse on this high, isolated hill. Here in this ancient town, over a concrete motor road, the sound of tramping troops was recently heard, with modern bombing planes roaring overhead.

Near the Plaza we bought small Canary bananas for picnic lunch.

Beyond Lérida we started into a region already assuming the bleak character of the Aragonese steppes. The road map showed our route cutting across spaces almost entirely blank—mile upon mile with no towns or villages. A stone marked the beginning of the Province of Huesca.

We crossed a long bridge high over the muddy Río Cinca and had in front of us nearly seventy miles of "treeless deserts, colored like volcano ash, gray torrents dashing



Photograph by Cohnitz from European

MIDNIGHT STREET DANCES ARE AN OLD SPANISH CUSTOM

Streetcars, busses, and taxis stop running in this Barcelona thoroughfare on July 20, as grown-ups and children join in the *sardana*, a favorite Catalan dance. Merrymakers clasp hands and skip in circles to the tune of a band stationed between two of the large rings. Even on ordinary nights, foreigners in Spanish cities, to their surprise, find youngsters playing in the streets at midnight.

over stony, trackless wastes, green oases in the depths of valleys, parched villages hardly distinguishable in color from the ground on which they stand." Such is the barren plateau of Aragon, in contrast with luxuriant Catalonia.

Along the road is wasteland with drab hills like sand dunes in the distance, not a house or a human being for miles.

The name "Aragon" is known to everyone, but to most of us it is only a name.

Other parts of Spain have a mixture of foreign bloods—Roman, Visigothic, or Moorish. Here we have the Aragonese, a people of relatively pure Iberian blood. Their forefathers, with the Catalans and Valencians, fought far afield and once conquered Naples and Sicily, striking terror along the Mediterranean.

HARDHEADED ARAGON AND NAVARRE

Aragonese independence and stubbornness have not diminished with the centuries. The Aragonese pride themselves upon these traits, and claim that there is only one province in Spain where the men are more hardheaded—near-by Navarre. They tell this tale:

Some Aragon peasants once met in a village inn. One claimed he was the most hardheaded of all. The partition dividing the rooms was made of brick laid end on end, forming a thin type of wall called a *tabique,* and he said he could drive a long nail straight through the partition, using his head as a hammer.

At once he became a hero. Excitement rose and bets were laid. A long nail was placed against the wall and the Aragonese started to butt it with his head. Onlookers were amazed to see the nail sink into the wall with each blow.

Suddenly, when only about half an inch of nail was left, its progress stopped. In vain the Aragonese butted harder. He banged ferociously, but the nail wouldn't budge. Exasperated, facing defeat and ridicule, he shouted, "The nail must be through the wall! Go in the other room and see."

His friends opened the door and gasped. There, tilted back in a chair fast asleep, with his head against the identical spot on the wall where the nail should have appeared, sat a farmer of Navarre!

Crossing into the Province of Zaragoza we came to Bujaraloz, a gray place in the desert. The sun was shining, but a cold, chill wind blew clouds of dust down the streets.

A sign nailed to a telephone pole said "Gasolina" and we stopped before a tightly closed shed. Not a soul was in sight. We got down and knocked, and some one shouted, "Who is it?" We yelled back that we wanted gasoline.

With much creaking of rusty bolts, the door swung open and two girls appeared. Between them they pushed out a red-painted gasoline tank on wheels and began to pump gas into our car. Buxom and strong, these girls looked as if they had seen much work in fields. Peeping through the doorway we could see a dirty and uninviting patio littered with straw and manure.

"It is cold today," I remarked.

"It is often cold here," one of the sisters replied in a dry, deep voice.

"What a disagreeable wind," I added, trying to coax some expression into the stolid face.

"It is often windy here," she said laconically.

I gave up.

Near Zaragoza we snapped a picture of three old women, bent and wrinkled and dressed in the usual plain black. An old man with them was a subject for an artist. On him modernity had made no change. He was in the typical costume of Aragon—short black breeches tied below the knee and adorned with many buttons, black stockings and white *alpargatas,* the strings of which were lapped several times in a tidy spiral around the ankles. His short jacket was of well-worn black velvet, also with many buttons, and on his head a narrow black silk handkerchief was tied so as to leave the top of his gray head exposed. These costumes are fast disappearing (412).

The toothless old fellow was jolly and quite willing to pose, but not so the women who, chattering loudly, tried to get away. The old man finally persuaded one of them to stand with him. She pointed to the camera and said, "Where are you going to take us? To Germany?"

ZARAGOZA, SCENE OF BITTER FIGHTING

Spires of Zaragoza came into sight, far on the horizon. Sunset turned western skies into soft shades of mauve and pink. Streetcars, tiny yellow ones, raced along the roadside. We crossed the long Bridge of Stone over the wide, brown Ebro, a bridge of seven arches. Built before Columbus



Photograph by Acme

"ON TO GUADARRAMA!" SHOUT VOLUNTEERS, AS CITIZENS OF MADRID GIVE THEM THE LOYALIST SALUTE WITH CLENCHED FISTS

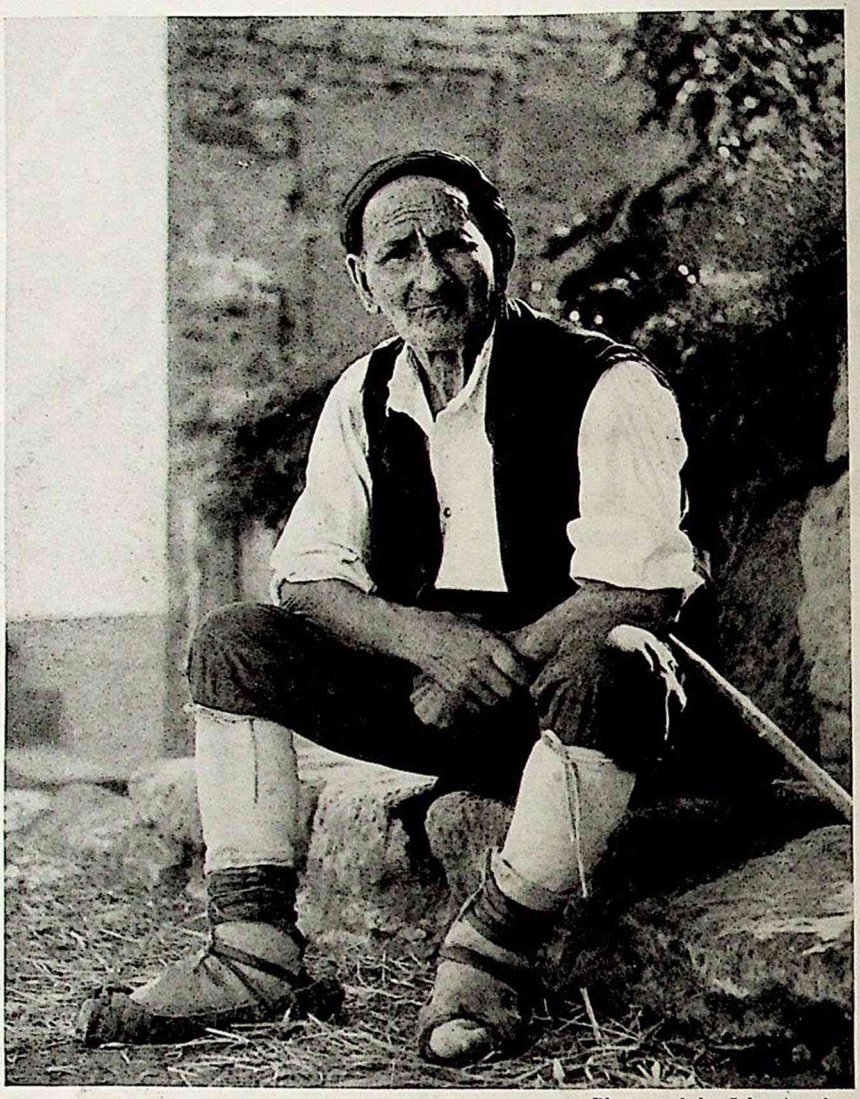
Their overladen bus lurching through the Puerta del Sol in the heart of the city, this contingent is bound for the Sierra de Guadarrama, northwest of the Capital, where Government forces held a vital mountain pass against attacking rebels. In happier days Madrid's central plaza was filled with animated crowds of shoppers, sight-seers, and café habitués. The Ministry of the Interior occupies the building at the left.



© AP from Pictures, Inc.

REBEL SYMPATHIZERS AT BURGOS GIVE THE FASCIST SALUTE TO GENERAL CABANELLAS

The bearded President of the insurgent Committee of National Defense (page 424) leans on the balcony railing in front of the second window from the right.



Photograph by Jalon Angel

RUGGED AND INDEPENDENT ARE THE MEN OF ARAGON

Amusing tales are told of their hardheadedness (page 409). Prosaic blue overalls are fast taking the place of the typical countryman's dress, with short jacket and breeches, rope-soled sandals, and silk kerchief wrapped round the head, leaving the crown exposed.

discovered the New World, it meets with ease the demands of modern traffic.

Beyond rose the roofs, the spires and domes of La Seo, Zaragoza's Gothic cathedral, shaded in pinkish amber of late afternoon.

We asked a policeman to direct us to a restaurant. He pointed to a little passageway just opposite, where there were two restaurants; but with a shrug of shoulders, he said that they were "nada más que regular"; in other words, only so-so.

Up a flight of narrow stairs we found ourselves in the tiny dining room of "La Viña P." A bald-headed waiter assured us that he himself would see to it that we were served "como un rayo," like a ray of lightning; this lightning proved to be of the slow-motion sort.

The city boasts ornate apartment houses with iron-studded doors and huge brass knockers, and over on the plain appeared the buildings of the former military school. In the awful revolution Zaragoza saw much fighting and bloodshed, and trembled under aerial bombardment.

Southward, flat barren Aragon gives way to hills and mountains. Beyond the Río Jalón, where ancient water wheels are still used for irrigation, the car climbs many hundred feet in a few miles. The mountains take on the color of dull-red bricks, and the mud houses of the little towns are so near the same color that one runs into the main street almost before one knows it. The Jalón is so wild that engineers had to build eight bridges and seven tunnels to lay rails over the short distance between Paracuellos and Calatayud.

WHERE PEASANTS LIVE IN CAVES

Steep sides of hills are perforated with rows of caves, one above the other—whole streets of them. These caves are the homes of peasants. Each has its door and some even boast a window or two.



Photograph from Wide World

A LOYALIST TRUCK DISTRIBUTES ARMS TO CIVILIAN VOLUNTEERS IN MADRID

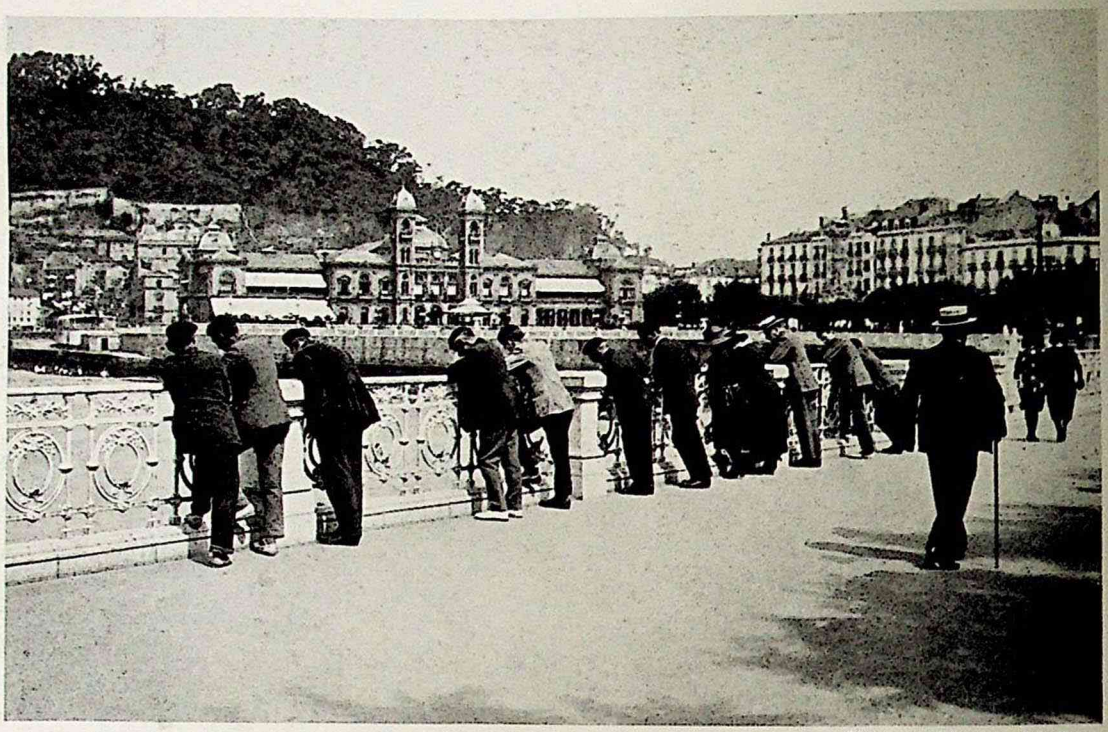
To prevent the vehicle from being fired on as it moves through the streets, the letters "CNT" are painted on the windshield and top to show that it belongs to the National Confederation of Labor, a powerful organization supporting the Government.



© International News Photos

WOMEN, TOO, SHOULDER ARMS AND MARCH CONFIDENTLY TO BATTLE

With male volunteers and a soldier of the Regular Army, right, they hurry out of Madrid to help stem the rebel advance on the Capital. Many women and girls have been reported killed and wounded in action.



Photograph by Angel Rubio

BASQUE TOWNSFOLK IDLY GAZE AT BATHERS AT SAN SEBASTIÁN, SPAIN'S PREMIER SUMMER RESORT

Some of the bitterest fighting of the civil war has occurred in this gay vacation place near the French frontier. Insurrectionists attacked the city to obtain a seaport on the Bay of Biscay. Below this promenade is the bathing beach. Monte Urgull rises behind the turreted Casino, formerly used for gambling (page 425).

At tiny Algora there had been a wedding, and peasant couples were dancing in the street: arms in air, snapping fingers, advancing and retiring with swiftly moving feet—an Aragonese *jota*. I hope this graceful dance may survive the modern trend, but even country children learn the latest American steps—at the movies!

Guadalajara stands on the Río Henares. How many of these towns got their names from the Moors! They named this place the "Valley of Stones," which in Moorish is Wad-al-Hajara.

Straight runs the road from Guadalajara to Alcalá de Henares, paralleled by the railway on one side and the Río Henares on the other, through a green valley. As a seat of learning, this little city once vied with Salamanca; then its colleges had upwards of 12,000 students. Cervantes was born here. So was poor Catherine of Aragon, later packed off to England to become the first of Henry VIII's string of wives.

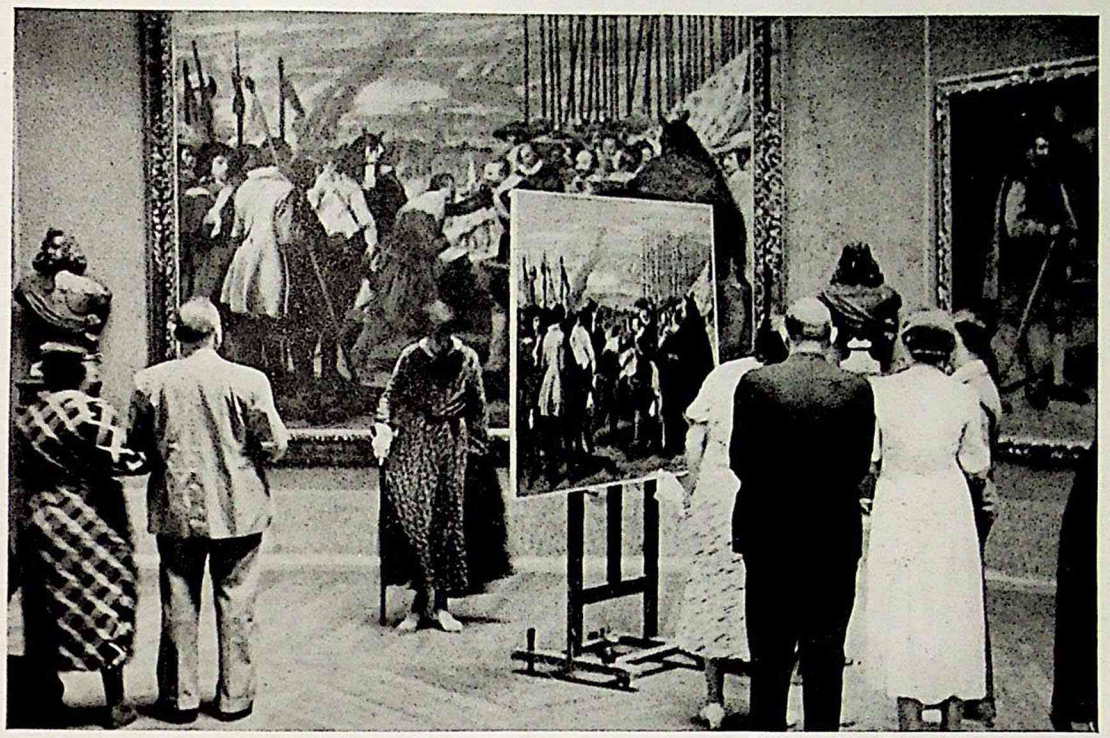
Said the New York Times, July 29, 1936: "The historic cathedral in Alcalá de Henares was destroyed in battle when large quantities of arms and ammunition stored within the edifice, where rebels took refuge, exploded."

Southwest of the town, farms are more prosperous looking and traffic thickens, hinting at approach to the Republic's Capital.*

MADRID IN PEACE AND WAR

Broad Calle de Alcalá runs straight into Madrid, passing the green gardens of the Retiro. On the Paseo del Prado is the large and simple red-brick museum of that name. If you ever get to Madrid, go straight to the Prado, pay your admission, check your umbrella, and enjoy this famous picture gallery of the Spanish kings. What the Louvre is to Paris the Prado is to Madrid. It contains more than 2,000 pictures, by Velásquez, Murillo, El Greco, Goya, and by painters of the Italian, Flemish, French, and other schools (opposite page).

* See "Madrid Out-of-Doors," by Harriet Chalmers Adams, in the NATIONAL GEOGRAPHIC MAGAZINE for August, 1931, and "A Palette from Spain," by W. Langdon Kihn, March, 1936.



Photograph by Cohnitz from European

MUSEUM-GOERS WATCH AN ARTIST COPY VELÁSQUEZ' "THE SURRENDER OF BREDA"

This masterpiece in Madrid's Museo del Prado shows the Spanish conqueror Spinola, backed by the bristling lances of his soldiers, receiving the keys of Breda from the Dutch in 1625. A court jester, right, is portrayed by Velásquez in the rich costume of a prince.

Madrid is not an old city. It is new. We Americans might qualify that adjective and say comparatively new. Moors built a fort here in the 10th century. In 1300 the place was growing slowly and by 1600 was a booming town of 3,000 inhabitants. This, however, is more or less modern history, compared with the deep, dark ages from which certain other large Spanish cities date their beginnings.

Madrid is almost the geographic center of the Republic, reached on all main railroads and public highways from all other cities and ports. Taxicabs are as thick as in Paris, and just as small and uncomfortable. A wide street, the Gran Vía, has been sliced through what was formerly a crowded area, and is today the principal shopping center. Some new buildings rank here as skyscrapers, 13 and more stories high; their basic idea came from their American counterparts, but their shells are covered in the more ornate Spanish manner.

The top end of the Gran Vía is becoming a Times Square, with its crowds, bright lights, moving signs, and din of motor horns. Traffic is worse here than at the corner of Pennsylvania Avenue and 14th Street in Washington. Picture palaces blaze with electric lights and show American films.

The Puerta del Sol, the very heart of Madrid, is an oval-shaped plaza into which debouch six of the principal streets. Surrounded by cafés and advertising signs, it is full of hurrying crowds, streetcars, and taxicabs. Colorful announcements of bullfights vie with advertisements of soccer games.

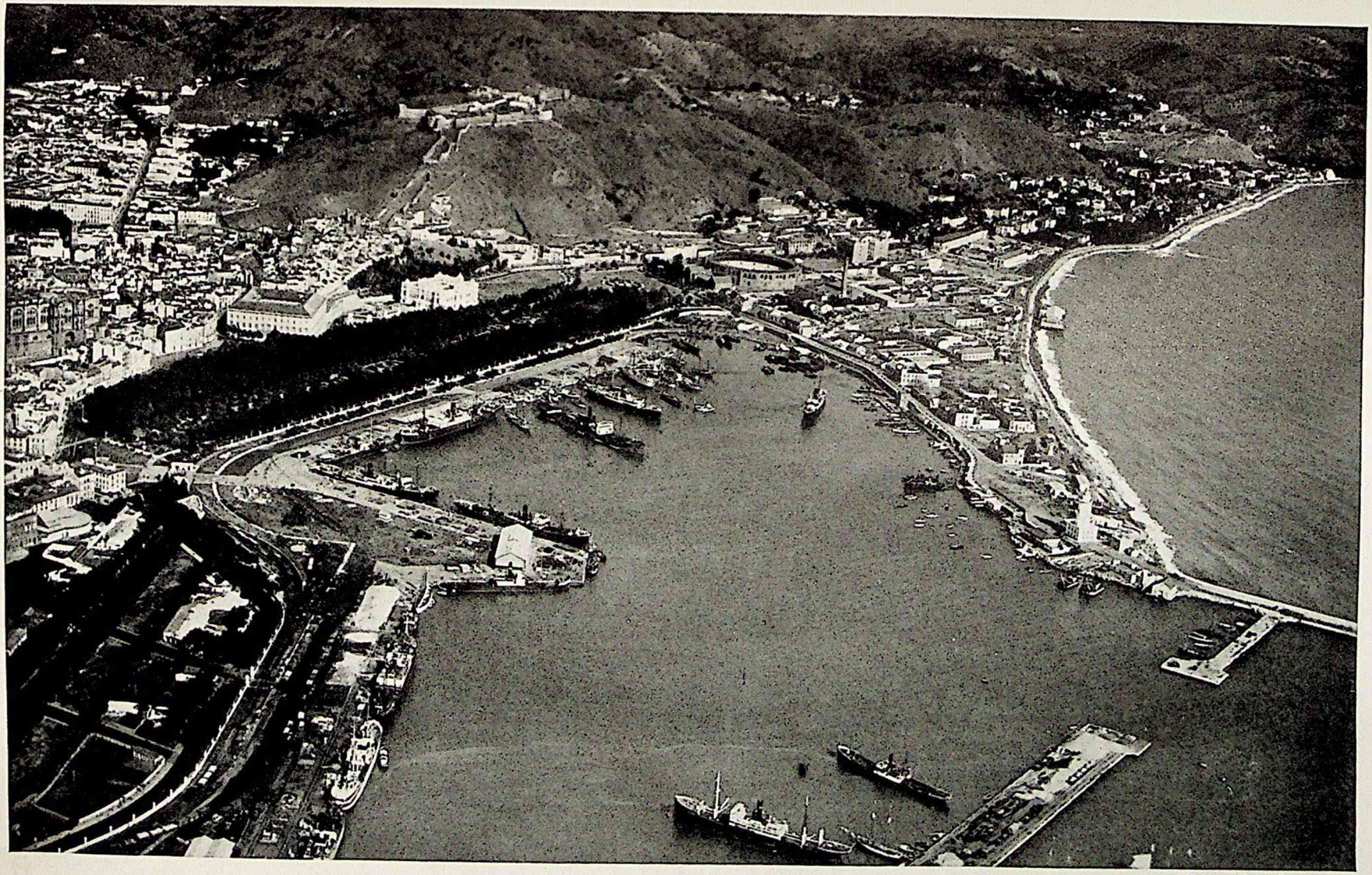
This spot was a scene of wildest disorder in the civil war, with thousands of troops and armed civilians, even women and girls, shouting "Viva la República!" All motorcars were requisitioned, communications cut, and troops rushed out the north road to defend the Capital and block the three lofty passes of the Sierra de Guadarrama.

In the Calle de Cisne stands the American Embassy. Here, during the upheaval, Eric C. Wendelin, young third secretary of the Embassy, added his name to that long list of heroes of our Foreign Service by gathering all Americans, numbering some 190, under the protection of the Stars and Stripes, turning the grand ballroom into a



DESOLATE MOUNTAIN PASSES SUCH AS THIS OFFER LITTLE COVER FOR CONTENDING ARMIES

Characteristic of bleak, sun-baked Aragon (page 407) are these hills a few miles east of Calatayud, on the main road from Barcelona and Zaragoza to the Capital. A telegraph line cuts diagonally across the pasture land toward a peach or algarroba orchard near buildings clustered on a knoll. Aragon was once the domain of Ferdinand, husband of Columbus's benefactor Isabella.



Photograph by Flandrin

SHOT AND SHELL HAVE RUINED MANY OF MÁLAGA'S FINEST BUILDINGS

A few days after a group of Americans were evacuated here by the U.S.S. *Quincy*, a clash between rebels and loyalists caused havoc in this Mediterranean port's main business district, left, shown here as it looked before the war. Atop the hill to the left of the bull ring, upper center, is the Gibralfaro, 13th-century Moorish citadel built on the site of a Phoenician fortress. A wide avenue skirts the harbor, where ships load wine, olive oil, canary seed, and other products of Andalusia (p. 427).



Photograph by Branson De Cou from Galloway

HER LOCOMOTIVE IS A PUBLIC CARRIER OF ICE CREAM

Hailed by a youngster in Vigo, the smiling engineer pulls up at the curb and sells some of the wares kept in drawers in the "cab."

dormitory for women and children, procuring food for a long siege, filling all receptacles with water when the city supply became threatened, and, lastly, arranging for the evacuation of his nationals by rail to the seaports of Valencia and Alicante.

Indeed, during the uprising our Foreign Service in the whole Peninsula performed smoothly and reliably. During the first several days of turmoil, almost the sole authentic news of what was happening came in flashes by roundabout telephone calls which these men found ways of getting through to the State Department at Washington. At one time the dispatches were telephoned from Spain to Buenos Aires and relayed from there to Washington.

During this first hectic period, British, French, and German newspapers were getting a large part of their information through our Department of State. Early news of the seriousness of the revolution enabled our Government to dispatch the *Oklahoma* and the *Cayuga* to the Biscayan coast, the *Quincy* to the Mediterranean, and the merchant ship *Exeter* to Barcelona, evacuating and undoubtedly saving the lives of many American nationals caught in the vortex of the rebellion.

Infantry, artillery, and cavalry surged past the big Palace and Ritz Hotels, past the imposing Department of Posts and Telegraphs, through Madrid's Park Avenue, the swanky Paseo de Recoletos. They moved into the long Calle de Bravo Murillo, which is only four or five blocks from the Castellana, but separated from it by a world; for Bravo Murillo is paved in rough stone blocks; normally it is full of carts that rattle, streetcars that clatter, and tradespeople who shout and get in the way.

On one side of the street is a long procession of sidewalk vegetable and fruit stalls, covered with little awnings. Business is brisk, and cooks and servant girls haggle over pennies.

Just outside the city the red-topped stone says 233 kilometers (144.7 miles) to Burgos, and we followed a road that winds up and down with many curves, but with asphalt as smooth as the Lincoln Highway. Fields of grain on either side were being plowed, two hulking oxen pulling an antique plow with a wooden share, moving at the rate of two miles an hour. Tractors may soon supplant this Roman method.



Photograph by Cohnitz from European

"BOTTOMS UP!" IS THE RULE WHEN BASQUE FISHERMEN PASS THE BOTTLE

A fine stream of sparkling cider trickles from the slender spout into the waiting mouth, so that the flask makes the rounds untouched by lips. Wives are left at home when the men come after work and cook a meal to their own taste in this clubhouse at San Sebastián. Beneath the portrait of the club's founder hangs the carved picture of a boat which won a rowing trophy.

BLEAK MOUNTAINS GUARD THE CAPITAL

Now we began to climb in earnest into the heart of the bleak Sierra de Guadarrama, cold, forbidding, its peaks often covered with snow and hidden in clouds, seven to eight thousand feet above the sea. On the other side of the road we looked down into a rough valley dotted here and there with splashes of pale green in the misty light, and made them out to be fields of grain.

We still climbed, but in none of the softness and sunshine usually associated with Spain. No more orange and olive groves. This is drab and gloomy. The mountainside is steep, rocky, and barren.

Large, queer-shaped bowlders are strewn over the level spaces, and on some we noticed advertisements for an enterprising dentist of Madrid.

No forests are seen, and practically no trees. Farmers work hard to coax scanty crops from such arid land and, strangely, they regard all birds as enemies. Trees shelter birds; hence, down with the trees.

Either we went higher or the clouds came lower, because suddenly we were among them. Cold and damp, it was like a thick fog; no fun on a mountain road. Sprawled across the road we saw, just in time to avoid collision, a large upturned motor truck. An axle had broken, upset

the car, and spilled a pile of vegetables. We edged over to the side and crawled by.

"Do you want anything?" we called to men who stood about the wreck.

"Nothing," they said, and we went on.

Still climbing, we reached La Cabrera, with its neat, new stone houses. Madrid families spend the summer in this cool altitude. The clouds began to rise and the near-by mountains loomed up on our left, but we had covered the highest part of the way, and, with many twists and turns, started gradually downward.

Thus we came to Buitrago, a rare discovery. Here, amidst the austere Guadarramas was a little town so odd as to take one's breath. Built on two hills, it was surrounded by the old city walls, brown with age but in many places still well preserved. A ruined castle, an old church tower, little cobbled streets that climbed and others that dropped, deep gorges with galloping water made an enchanting picture.

Near town we passed a house on fire. A young woman was standing by a few poor pieces of rescued furniture and a straw mattress. She smiled and waved her hand as we went by.

As we approached tiny Robregordo, built on a steep slope up from the roadside, the sun was doing its best to dispel the mist. The road here has straightened considerably, but still climbs and descends.

I doubt if Buitrago and Robregordo had ever before appeared in American news. But last July correspondents flashed from these hamlets in the Somosierra Pass that rebel forces still held on, and that here would be a main point of assault for loyalists. Tired forces after eleven days of fighting rested from their efforts. "There was minor machine gun and artillery fire today, which had no important result, and some ineffectual bombing of loyal artillery by rebel airplanes."

FARMERS STILL USE WOODEN PLOWS

All the way from Madrid to Aranda, the road passes through no villages of more than thirty or forty houses. But on every side these Spanish farmers see improvements under way; every industry in the country, except farming, keeps pace with modern practice.

As for the average small farmer, he still plows with a wooden plow invented by Romans, drawn by two large oxen moving at a snail's pace, and on hillsides he builds big stone walls to hold up a few square feet of tillable earth. If the land is tilted at too steep an angle for the oxen, the farmer calls in a dozen of his neighbors; they form a line and spade up the earth by hand.

A bridge crosses the Duero, which changes its name and nationality, becoming the Douro when it enters far-away Portugal and flows into the Atlantic at Porto. The muddy town of Aranda is no metropolis. But its Hotel Ibarra, with plain board floors and whitewashed walls, is good shelter. Two young girls, not too tidy, made up in smiles and willingness for other defects. They brought us coffee. We were now only 80 kilometers (about fifty miles) from Burgos, and soon saw the graceful towers of its famous Cathedral.

BURGOS, THE REVOLUTIONARY CAPITAL

We entered the city through the Arco de Santa María. Imagine a structure in brown sandstone about five stories high, with semicircular columns flanking the two sides, four battlemented round towers on top, and a graceful arch leading through the gateway.

We were in Burgos not more than 15 minutes before we were quite in agreement with its contention that its inhabitants speak the purest and finest of all Spanish. Every syllable and letter is pronounced in musically modulated voice, and the people speak distinctly. Burgos is to Spain what Hannover is to Germany.

Peasant women clatter across the thoroughfare in wooden shoes, but at the corner you can buy the New York Herald-Tribune, European edition.

The Cathedral is so shut in by buildings that one must go around in front and climb a cobbled ramp to get a good look at it. Critics say it is one of the most beautiful of all Gothic structures. It was founded in 1221, and nowhere is there architecture more graceful than its two main towers, lacy, windowed, so that light shines through.

Little girls, rosy-cheeked like English children and resembling very little their olive-skinned sisters of Andalusia, play hide-and-seek around the Cathedral, heads and shoulders wrapped in red woolen shawls.

From the bridge we could see the old ruined fortress on a hill overlooking the city. Here in 1812 Wellington besieged the French troops. Today the ancient city becomes again the center of desperate strife.



Photograph by Talbot M. Brewer

BULLS AT THEIR HEELS, BOYS SPRINT FOR THEIR LIVES AS ONLOOKERS CHEER

At six in the morning on the feast day of San Fermin, bulls for the afternoon's fight are turned loose to run from their corral to Pamplona's ring. Two or three hundred youths jump into the runway and race at top speed before the excited animals, which not infrequently overtake runners and gore them, sometimes fatally. Spectators' cars are parked beside the large building.



Photograph by Fritz Henle from Black Star

USING ROMAN FOUNDATIONS, MOORISH CONQUERORS BUILT CÓRDOBA'S 16-ARCHED BRIDGE OVER THE GUADALQUIVIR

Rebuilt several times, the structure now carries automobiles and trucks, which in Spain are mostly of American manufacture. The bridge leads directly to the huge Cathedral, a former Moorish mosque begun more than 1,100 years ago with the object of attracting Mohammedan pilgrims to Córdoba instead of Mecca. During the civil war the Spanish Government expressed the hope that such historic monuments would be spared (page 427).



© AP from Pictures, Inc.

A COLUMN OF REBEL MILITIAMEN GETS A BIG SEND-OFF AS IT LEAVES BURGOS TO REINFORCE PICKET LINES

Making this city their headquarters in northern Spain, insurgents marched southward on Madrid, while their comrades in Sevilla attacked the Capital from the other side (map, pages 402-3).

Revolutionists chose it as the seat of their new government. By radio they flashed this message to the Foreign Offices of great powers:

"Burgos, July 29, 1936, midnight.

"Committee of National Defense to the Minister of Foreign Affairs:

"I have the honor to inform Your Excellency's Government of the formation and assumption of power of the new government of the Spanish State under title of Committee of National Defense, constituted on the 23rd instant at its provisional seat, Burgos, with myself as President, and with the following members: Miguel Cabanellas, General of Division; Andrés Saliquet, General of Division; Miguel Ponte, Brigadier General; Emilio Mola, Brigadier General; Fidel Dávila, Brigadier General; Federico Montaner, Colonel; and Fernando Moreno, Colonel. Our Government hopes and desires to maintain with that of Your Excellency the same cordial and friendly relations which have always united our two countries.

"The President of the Committee of National Defense, Miguel Cabanellas."

Burgos to San Sebastián is a four- or five-hour drive over a bleak and stony plateau. High limestone mountains loom up ahead and you come to Pancorbo, where of modern things only automobiles and telephones have arrived.

HOME OF AN ANCIENT, STURDY RACE

When you cross the border into the Province of Álava, it is like entering a new country. For Álava, with Vizcaya and Guipúzcoa, is one of the Basque Provinces —the smallest in Spain but looming large because of their rich iron mines, modern industry, and independent characteristics. Basqueland really comprises not only these three provinces but also part of Navarre and the adjacent region of southwestern France.

Basques are mountain folk and are usually regarded as the oldest race in Europe, the unmixed descendants of the original inhabitants of the Iberian Peninsula.*

The remarkable fact is that we still find about 500,000 Basques in northern Spain and nearly 200,000 in southern France; more than a million have emigrated to North and South America.

* See "Land of the Basques," by Harry A. McBride, NATIONAL GEOGRAPHIC MAGAZINE, January, 1922.

They are good farmers, fine seamen and fishermen, strong physically and morally. A French author describes the Basques as "the best-looking, healthiest, most alert, and happiest folk that it is possible to find in Europe."

Vitoria, capital of Álava, has some 43,000 people. Its Calle de Castilla leads into the fine wide streets of the new town, lined with trees and attractive buildings, most of them fronted with the ever-present miradors. How strange to see on such modern thoroughfares solid-wheeled bullock carts moving slowly behind pairs of oxen, among the more speedy traffic of motorcars!

In a clean little cafe full of marble-topped tables, men were sitting in groups of four, drinking coffee with anisette and playing dominoes. Dominoes in Spain takes on all the fine points of contract bridge at home and is quite as popular.

Outside the city, roads branch off to the north toward Bilbao—the largest Basque city and the Pittsburgh of Spain. It lies under a pall of smoke from iron mines, steel mills, and huge shipbuilding yards.

How un-Spanish and wholly Basque are names of near-by villages — Olazagutia, Iturmendi, Icazteguieta, and the mountain peak of Irumugarrieta, 4,682 feet high! Tall chimneys of industry begin to appear, and a huge cement factory spreads its gray dust along the roadside.

Soon comes the Province of Guipúzcoa. The road, which has been climbing gently, now behaves in a thoroughly mountainous manner. There are ups and downs, hairpin curves, and narrow turns around deep precipices and, for miles, forests of beautiful pines, green and refreshing after the cold, bare mountains of Castile.

A TASTE OF SPANISH PRIDE

A Basque woman living in a pretty farmhouse one day cleaned all her many copper pots and kettles and stood them outside in a row in the sun. This is usual in Spain, as the women say the sunshine makes the copper shine more brightly.

A foreign woman, traveling through, said to her companion, "What a shame! Look at that display. Even these peasants are waiting to catch the tourist. It's so grasping."

Walking up to the woman, she inquired, "How much are you asking for that copper jug in the middle?"



Photograph by Angel Rubio

FISHWIVES OF BILBAO SELL BONITO FRESH FROM THE SEA

The delicious fish advertised on the sign is a favorite along the coast of the Bay of Biscay. This woman's business may not be as brisk as it looks, however, for most of the bystanders have gathered to watch the photographer. Civil war is an old story to Bilbao; the city was besieged three times during uprisings in the 19th century.

The peasant woman was enraged. One arm akimbo, and the other making violent gestures to emphasize her speech, black eyes flashing, she said, "Listen to me, señora. You may not mean to be insulting. But every one of those copper things has been in my family since before the Carlist wars. My old grandmother cleaned them just as I do today. Sell them? Would you sell me the picture of your mother off the wall of your parlor? You may go gargle your throat, señora!"

The pride of the Spaniard! The lowliest laborer in the fields is innately a gentleman; he treats you as one, expecting like treatment in return.

Along the road are quince trees. Grown all over Spain, quinces are boiled and the juice extracted for quince jelly, a popular delicacy, while the remaining pulp is pressed into molds of various sizes and sold in the whole country as *carne de membrillo* (quince meat). Spread upon bread, it takes the place of jam and is as popular in Spain as orange marmalade is in England.

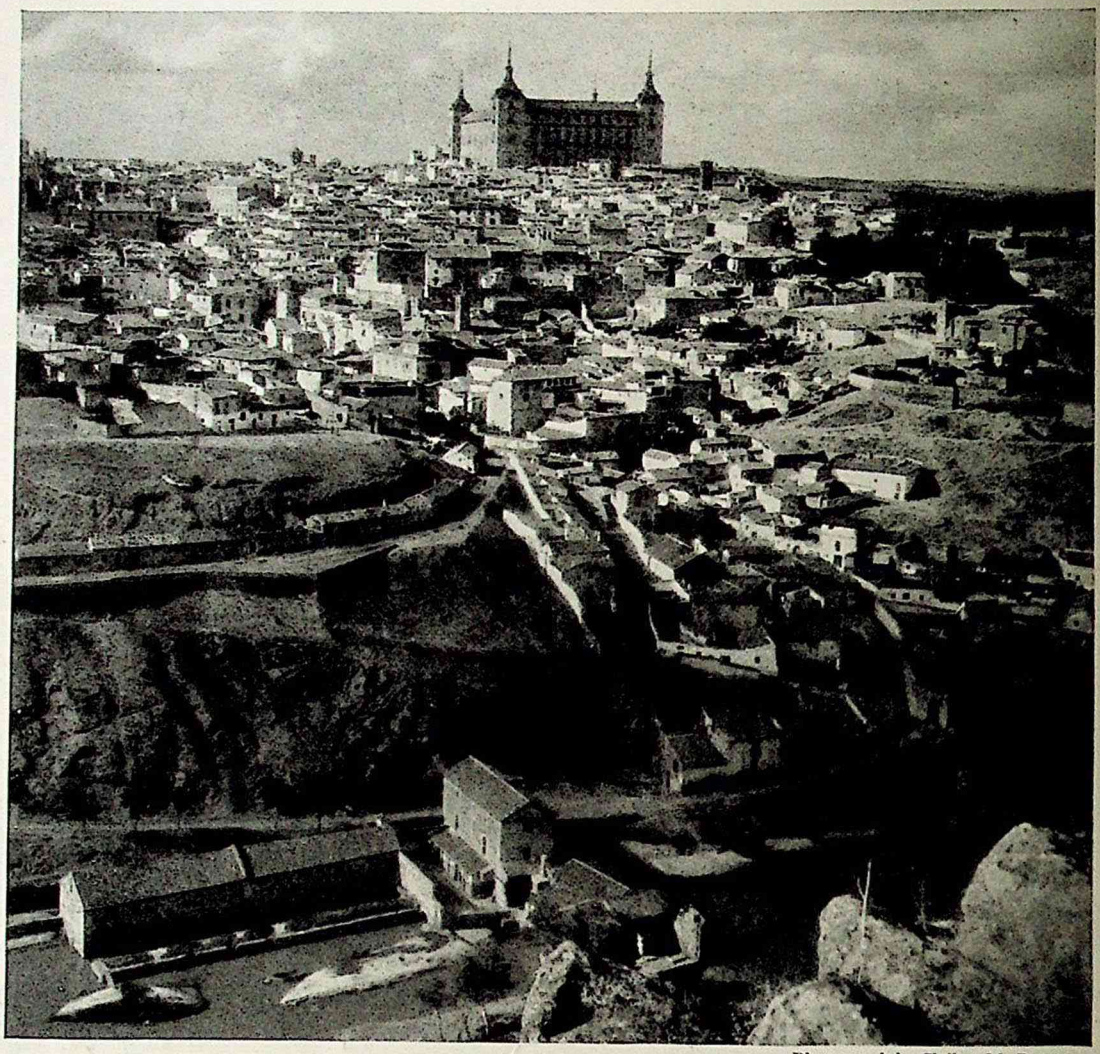
Entering Tolosa, one notices on the right, between road and river, a long, four-storied building overtopped by tall chimneys. This is one of the largest paper mills in Spain. Sidewalks are crowded with girls and women coming from work in the mills.

Another busy but tiny town is Éibar, on the border of Vizcaya. It is so small that it appears on maps in the most diminutive type. Yet it is known all over Spain for its fine revolvers and pistols. Today they even make typewriters and office appliances, as well as a sort of Toledo jewelry—gold and brass inlaid in steel.

Soon now we saw the Atlantic. Dark mist lay over the Bay of Biscay and huge breakers beat against rock-bound coast, sending up splashes of spray.

GAY SAN SEBASTIÁN A BATTLEGROUND

Traffic thickened on the road as we neared San Sebastián, capital of Guipúzcoa. In summer months this is the gayest of Spanish resorts. Broad sands of the famous Concha are filled with Spain's noblest and wealthiest in bathing suits. A crescent of



Photograph by Talbot M. Brewer

IN TOLEDO'S TOWERING ALCÁZAR, BESIEGED REBELS DEFIED THE GOVERNMENT

Cadets of the military academy in the historic fortress-palace barricaded themselves here with hundreds of other insurgents at the outbreak of the civil war. Loyalists installed a loud-speaker near by to announce Government victories and to demand the rebels' surrender. Standing on the highest ground in Spain's former capital, the Alcázar was built mostly by Charles V, grandson of Ferdinand and Isabella. The Tagus River, foreground and upper right, flows moatlike around three sides of the city.

sumptuous hotels forms a proper background for this gay picture (page 414).

But last July this picture was not gay. San Sebastián was one of the most hotly contested battlegrounds of the revolution. Lost and retaken several times by the combatants, its streets ran with blood.

In one of its fashionable hotels, the Continental, were the summer offices of our Embassy. For five days our officers were isolated here with no word from the outside world. They could not even reach Ambassador Bowers at his summer place at near-by Fuenterrabía. They had no means of defense. Leftist soldiers, merely peasants armed with rifles, many of them women, swept past the doors—killing.

In place of the pretty white yachts which usually dotted the bay were grim war vessels—American, British, French, and German. At last our ship, the *Cayuga*, was able to evacuate our Ambassador and his diplomatic staff. It later became a floating Embassy and carried the Ambassador all along the northern coast, taking off hundreds of Americans and other foreigners. To the little French resort of St. Jean-de-Luz the *Cayuga* and the *Oklahoma*, as well

as British and French ships, brought refugees of a dozen nationalities.

War spread rapidly along this north coast. Bilbao, then the whole Galician section, became affected. In Vigo our Consul, looking out of his office window in the new, modernistic bank building in the center of the city, saw 18 persons killed in the street on the first day of fighting.

WAR CLOUDS IN SUNNY ANDALUSIA

Far in the south, sunshiny Andalusia thundered with cannon's roar. Peasantfolk, gay and cheerful, who should have been gathering their almonds, drying their raisins, and picking their olives, quit work and went to war.

In this region city laborers have long discarded any distinctive garb and have turned to blue overalls. Many farmers, however, still stick to wide-brimmed, high-crowned Córdoban hats and the brown corduroy trousers held up by red or blue sashes. Country produce still trickles into Málaga on donkey back, but every year sees more small trucks on the road, more motorbusses plying between the towns.

In all the south, Málaga has felt the quickening pulse of modernity more than any other city. It has torn down old buildings, straightened and widened streets, acquired tea dances and elaborate cinemas. It has built hundreds of beautiful villas in flowered gardens; but, alas, many will have to be rebuilt after the conflict, and this year Málaga's almonds and raisins may be missing on American and English markets.

Clean streets, trim traffic officers, first-class hotels await the visitors. Málaga wages an active campaign to attract tourists and already many foreigners are seen on its streets in the winter months (p. 417).

Yet contrasts survive. Parallel with new streets lie narrow crooked ones of centuries ago. Fishermen still pull in their nets and swing through town calling out the amazing varieties of their catch. Mixed with motor trucks, big two-wheeled *carros de bolsa* come in loaded with produce of mountain towns. Some are drawn by five or six mules, all hitched single file.

Saw-toothed sierras surround the city, giving it a beautiful blue and purple background against the sky. Along the very crest of one of them there is a tiny straight line—the road to Granada. It rises from sea level to a height of 3,000 feet in a 45-minute drive. Wide motor roads wind along the coast, east to Almería and west to Gibraltar, through scenic beauties unsurpassed in Europe.

To Córdoba the highway becomes a lane through thousands of olive trees. When harvest has begun, you meet groups of men, women, and children on their way to pick olives. The women put on heavy, padded trousers to protect their knees. It is backbreaking work, kneeling all day in soft, wet earth, gathering olives into small baskets, while the men knock them off the trees with long poles.

Córdoba nestles on the banks of the Guadalquivir, with a beautiful bridge of 16 arches built by the Moors (page 422).

Here are taxi stands, with rows of bright, new American cars, and films fresh from Hollywood. The main plazas have been enlarged, asphalted, transformed, surrounded by attractive, ornate new buildings, ambitiously following the lead of Madrid. But in the narrow streets of the old town one stops and exclaims before each iron-grilled doorway that leads to a cool, flowery patio where a little fountain plays.

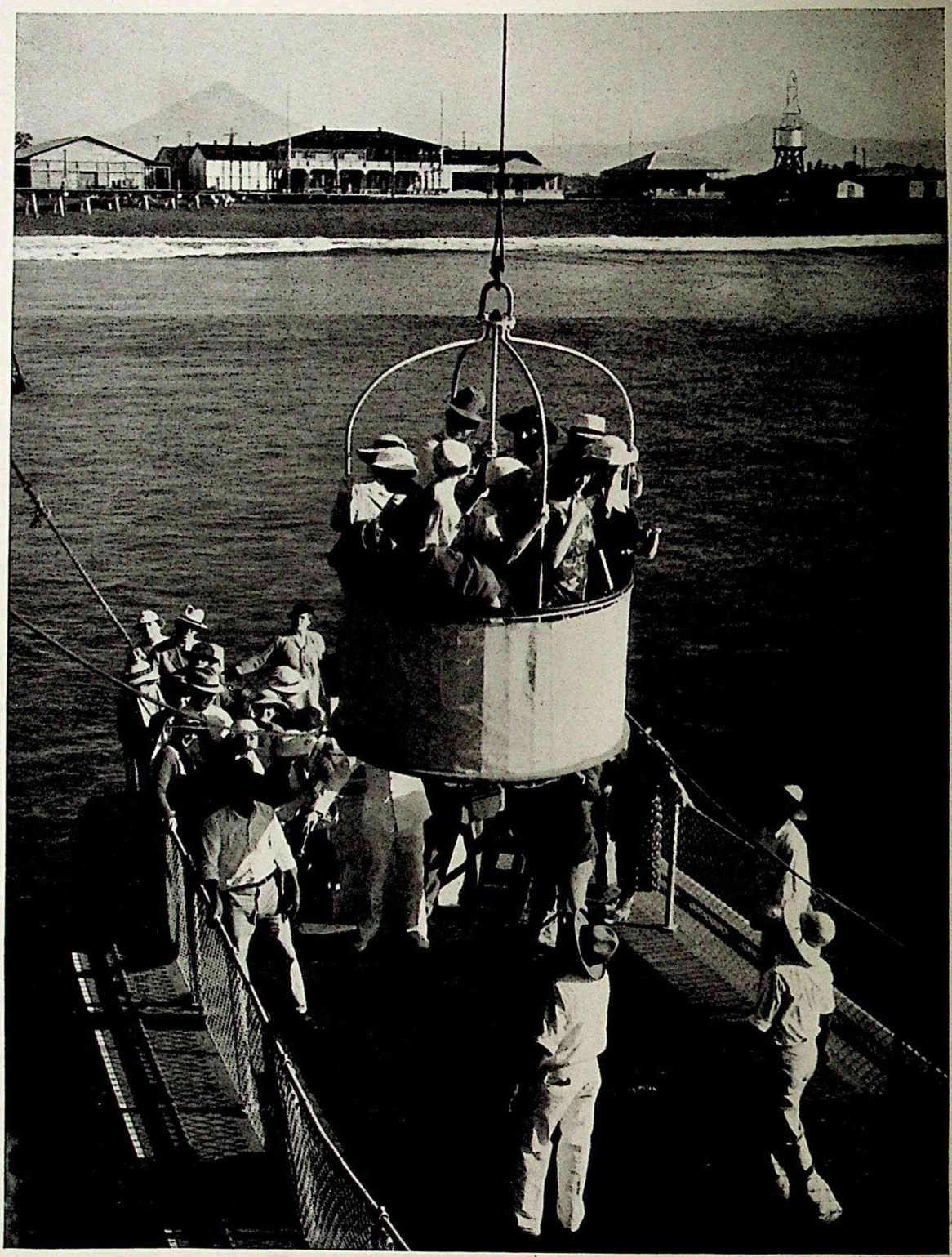
Here is the Mezquita, greatest religious edifice built by the Arabs in Spain, a veritable forest of columns, with some 850 still standing.

On an evening last July, the Madrid-Sevilla express stopped as usual at Córdoba's station. After an hour's wait, passengers grew restless, made inquiries of worried trainmen; they saw darkness come, heard shots, cries, the rattle of machine guns, through a long night.

Morning brought news that the city was in rebel hands. The passengers found refuge in local hotels, saw troops enter in long lines of trucks; militia hurriedly formed and drilled; all the blue denim available was bought up for uniforms. Reports came that near-by villages were in flames, with hundreds killed.

To one who has lived years under Andalusia's calm, cobalt skies, the civil war seems an absurd impossibility; yet here it is. Córdoba's mosque, Sevilla's Giralda, and the lovely gardens of Algeciras have seen death and destruction. San Roque, perched upon a rocky cliff just inland from Gibraltar; or the long main street of tiny, obscure Estepona—little did I ever expect to see their names loom so large in American newspapers.

How much more this war may change Spain nobody knows.



Photograph by Alfred T. Palmer

COMING ASHORE BY THE AERIAL ROUTE AT SAN JOSÉ

Everyone grabs the center pole, like boys choosing sides with a baseball bat, and a crane quickly lifts the circular railed platform from the bobbing tender to the pier shed. It is a thrilling experience on days when the sea is rough. Such devices are necessary on the Pacific coast of Central America, where there are few good harbors and large ships must anchor offshore. In the background is the water front of San José, with several blue volcano cones rising dimly beyond.

GUATEMALA INTERLUDE

In the Land of the Quetzal a Modern Capital Contrasts With Primitive Indian Villages and the "Pompeii of America"

By E. John Long

"STAND BY! You're going over the side!" shouted an efficient young deck officer from the rail of the "Santa" liner, as it rose and fell with the measured breathing of the sea a mile off San José, Pacific gateway to Guatemala.

Six of us, seated in the "cradle," which resembles the open cars on a Ferris wheel, felt a slight jerk as the rising boom tightened the heavy supporting ropes. The next moment we were swinging in mid-air.

Presently there came a lull. The cradle poised well beyond the rail. A whistle blew sharply, and we were lowered to the flat top deck of a bobbing tender alongside. In a few minutes we cast off, a tug swinging the tender around and heading it for a long steel pier jutting out from the shore.

Ahead we could see a line of foam where big combers dashed up the steep, palm-fringed beach. Crowded together along the shore were a few weather-beaten buildings roofed with corrugated iron. Blue and hazy in the distance rose the cloud-tipped cones of several volcanoes and the dim, mysterious mass of the Guatemalan highlands.

With a resounding bump the tender was swung alongside the rusty iron piles of the pier, a stout cable holding it just out of reach of the surf. Here the process of getting ashore was the reverse of leaving the ship, except that a circular railed platform, with a center pole to hold to, lifted groups of eight or ten passengers at a time.

THROUGH GUATEMALA'S BACK DOOR

San José is a sleepy little tropical port. Between steamers this "back door" to Guatemala drowses in the shade of tall breadfruit trees and coconut palms, and carries on a desultory commerce with the Indians of the coastal lagoons.

Its dingy water front, ragged porters and fishermen, stifling heat, and main street preëmpted by railroad tracks give no promise of the color and activity of Guatemala's gay, modern capital, high up in the cool central plateau; nor of the pristine beauty of its smoking volcanoes and deep-blue lakes; nor of the primitive charm of highland Indian villages whose markets rival oriental bazaars for color, wares, and brilliant native costumes (Color Plate VII).

Nondescript iron-roofed warehouses scarcely suggest the grandeur that was Antigua, the old Spanish capital and the "Pompeii of America." Steam whistles and the raucous cries of parrots are hardly a prelude to the haunting melodies of the marimba, which one hears everywhere in the rugged highlands.

QUETZAL IS BOTH COIN AND BIRD

When we bought our tickets for Guatemala City at the San José railroad station, we learned that the country's currency is on a par with that of the United States. The unit of exchange is the *quetzal,* named for the national bird of freedom (Color Plate VI), and it is worth exactly one dollar. One reason for this happy financial condition is that Guatemala enjoys a favorable balance of trade, exports exceeding imports by more than $2,500,000 in 1935.

The first part of the 73-mile journey to Guatemala City follows a gently rising plain, whose black volcanic soil is planted thickly in bananas, sugar cane, cotton, cacao, and fruit trees. Guatemala City is nearly a mile above sea level, in the cool and healthful *tierra templada,* or temperate zone, and the train must gain most of this altitude in the last fifty miles (map, p. 432).

Not far beyond Palin the line creeps through a narrow valley between two towering peaks and comes out on the edge of mountain-rimmed Lake Amatitlán. For several miles we wound along the shore, passing groups of Indian women washing clothes in hot springs at the water's edge. It is a convenient laundry, for clothes may be boiled in the springs and rinsed in the cold, fresh water of the lake without taking a step!



Photograph by Henry Clay Gipson

A HUMAN ANT SHOULDERS A LOAD AS TALL AS HIMSELF

This pottery merchant, leaving the market place at Santo Tomás Chichicastenango, easily carries his huge burden over rough mountain trails a mile or two above sea level. He hoisted the pack to his back with the help of bystanders and may go seven or eight miles before stopping to rest. On top is tied the straw mat on which he sleeps beside the road.

The train approached Guatemala City through verdant suburbs which gave way to warehouses and railroad yards, indicating the commercial activity of this busy Latin American capital.

"WINTER" BEGINS IN MAY

From the terminal, taxis whisked us over smoothly paved streets to our hotel, a grandiose structure with a glass-covered patio, mahogany floors and furniture, and very high ceilings.

I commented to the clerk, a courteous Norwegian, that the air seemed a trifle chilly.

"Yes, the winter is just beginning," he replied.

Winter? In the Tropics? And in May?

He explained that "winter" in Guatemala is the rainy season, May to October, a period of clouds, dampness, and dismal rains, although, he hastened to add, "part of every day is fair and sunny." In "summer," November to April, there is little or no rain, the sun shines throughout the day, and the people are healthier and happier.

We were awakened the next morning by the clamor of church bells, the rumble of heavy oxcarts, and the musical chimes on carriages bearing worshipers to early Mass.

Guatemala City, the most populous place in all Central America, is compactly built.

Stand on the roof of one of its modern buildings and you see a clean and pleasant community, most of whose white, blue, pink, and buff-colored houses and shops are one or two stories high. Only a few concrete business buildings and stone church towers rise above the prevailing flat, red-tiled roofs.

CAPITAL FOUNDED IN 1776

Founded the year the United States declared its independence, Guatemala City is a comparative youngster among the communities of Latin America. Several times

it has been damaged by earthquakes, and in 1917 almost the entire city was destroyed. It has lost its Old World air, although it still has many Moorish-type homes with iron-grilled windows and patios aglow with flowers.

With a population of 120,000, including about 6,000 foreigners, Guatemala City is today a thriving metropolis of well-paved streets, department stores, luxury shops, cafés, country clubs, busy factories, garages, and modern hotels. Its motion picture theaters, showing mostly American "talkies" with Spanish subtitles, advertise with big electric signs overhanging the streets in Broadway style (page 435).



Photograph by Kurt Severin

AROUND HER NECK SHE WEARS OLD SPANISH PIECES OF EIGHT

The heavy silver coins are in great demand as ornaments among the highland Indians of Central America. This woman of Totonicapán has the money strung in a necklace with colored beads, but the figured blouse is probably more valuable than her heirloom "treasury." The cloth on the head serves as napkin, tablecloth, market basket, and pad in carrying loads.

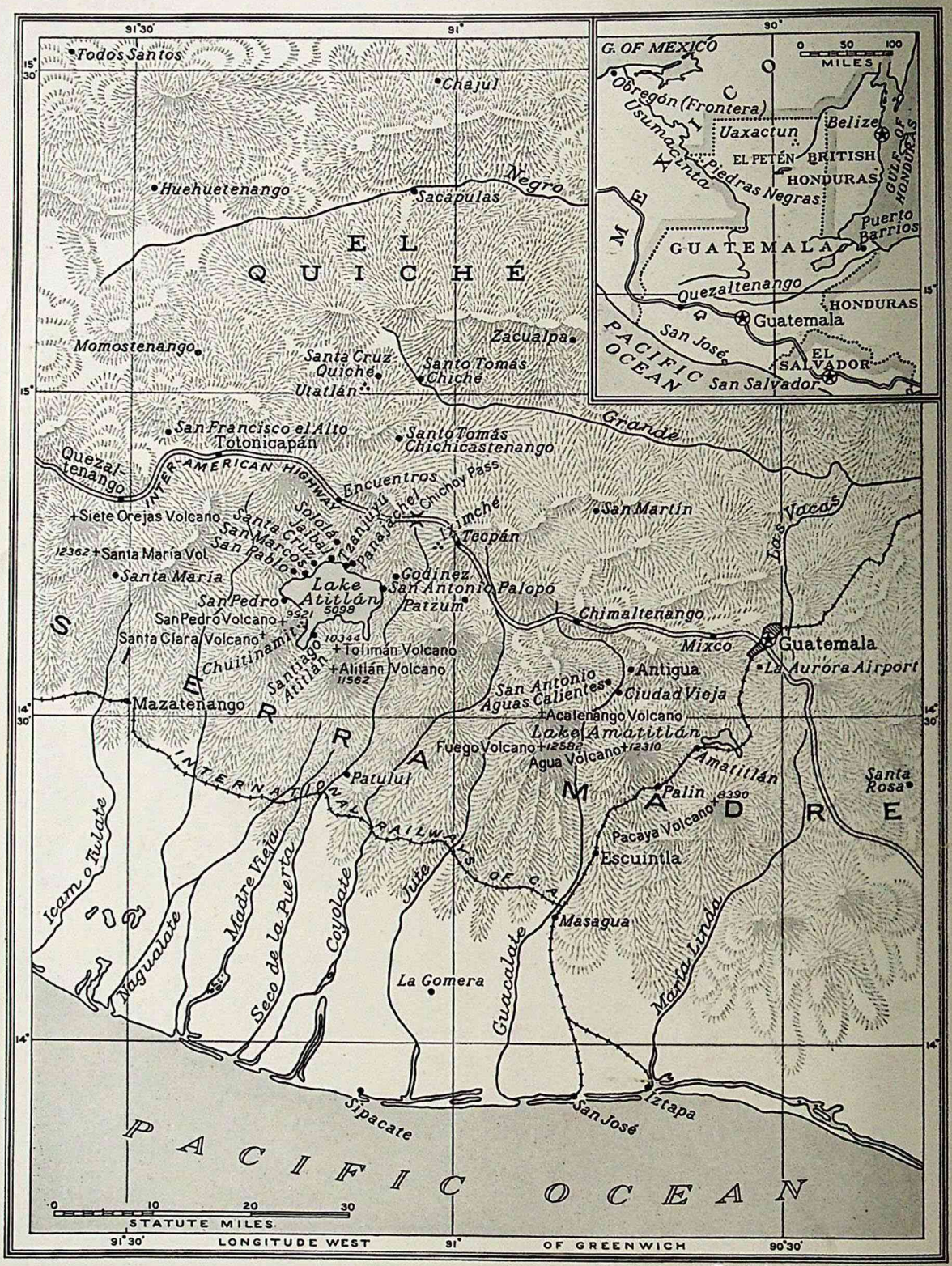
At the Capital's covered central market, the largest in the country, the array of foodstuffs, textiles, utensils, furniture, and other commodities is endless. Its long aisles, and the streets adjoining the market building and cathedral, are always jammed with a noisy, restless throng of merchants and buyers.

STRANGE SIGHTS AND SMELLS

And the odors, strange, spicy, and heavy! The fresh scents of vegetables and exotic flowers mingle with the greasy smell of cooking food, the aroma of roasted coffee, and the balmy fragrance of copal incense.

Those with weak stomachs may not like the appearance or odor of freshly slaughtered meat. Nor will they find appetizing the leached corn mash for tortillas; or armadillos roasted in their shells; or crude brown sugar pressed into dirty blocks and balls. But visitors are delighted with bright tropical fruits piled in artistic disarray, graceful baskets and glazed pottery, and gay textiles woven on primitive hand looms (Color Plate IV).

Guatemalans are proud, and justly so, of the fine coffee grown in their highlands



Drawn by Newman Bumstead

GUATEMALA'S HIGHLANDS ARE POCKMARKED WITH VOLCANOES

Rising abruptly from the narrow coastal plain along the Pacific is a rugged, mountainous region that ranges from 3,000 to 14,000 feet above sea level. In this temperate zone of fanglike peaks and deep-blue lakes lives more than half of the country's 2,285,000 population. Guatemala, a little larger than the State of Ohio, is the most populous of the Central American republics and ranks second only to Nicaragua in area.



Photograph by Alfred T. Palmer

MOUNTAINS, RIVERS, AND SEAS—IN MINIATURE

On this relief map, near the Temple of Minerva in the Capital, the topography of the entire Republic of Guatemala is reproduced in concrete. Flowing water tumbles down miniature stream courses into large basins representing the Pacific and the Gulf of Honduras. Towns, railroads, and highways also are indicated. From observation platforms, crowds view this attraction, which covers about a third of an acre. The mountains are really not so steep as this, as the vertical scale has been exaggerated five to one.

(page 446). Placards in English and Spanish remind the visitor at every turn that "Guatemala Grows the Best Coffee in the World."

On the days when tourist trains arrive in Guatemala City, the Department of Agriculture holds open house. Small packages of freshly roasted coffee, wrapped in glazed paper, are presented to each visitor. They are appropriate souvenirs of a nation which is the sixth most important coffee grower in the world, being exceeded only by Brazil, Colombia, the Netherlands Indies, Venezuela, and El Salvador.

The second most important export is the banana, grown in the coastal plains bordering the Gulf of Honduras and the Pacific.*

One of the busiest spots to-day in this busiest of Central American capitals is La Aurora Airport. Here the trunk line of the Pan American Airways from Brownsville, Texas, to Panama connects with a half-dozen local air services to distant parts of the Republic.

Fascinating as is Guatemala City, however, it is but a prelude to that native Guatemala which is older in race, culture, and traditions. High in the Sierra Madre west and north of the Capital, pure-blooded Indians still dress as did their ancestors, worship their old gods as well as the new, and live their lives almost unaffected by modern civilization.

Until a few years ago, when the Government launched an extensive road-building program, travel in the highlands of Guatemala was slow and arduous. Now one may motor from the Capital westward to the Mexican border and east to El Salvador (map, opposite page).

Early one morning in May we set out from Guatemala City in one of the newest streamlined American motorcars. At the edge of the city we paused while our chauffeur muttered a few words to a detail of soldiers. He and the soldiers compared watches, after which we drove on.

* See "Guatemala, Land of Volcanoes and Progress," by Thomas F. Lee, in the NATIONAL GEOGRAPHIC MAGAZINE for November, 1926.



ROUGH PLAY HAS TAKEN TOLL OF A PROUD TURKEY'S TAIL FEATHERS

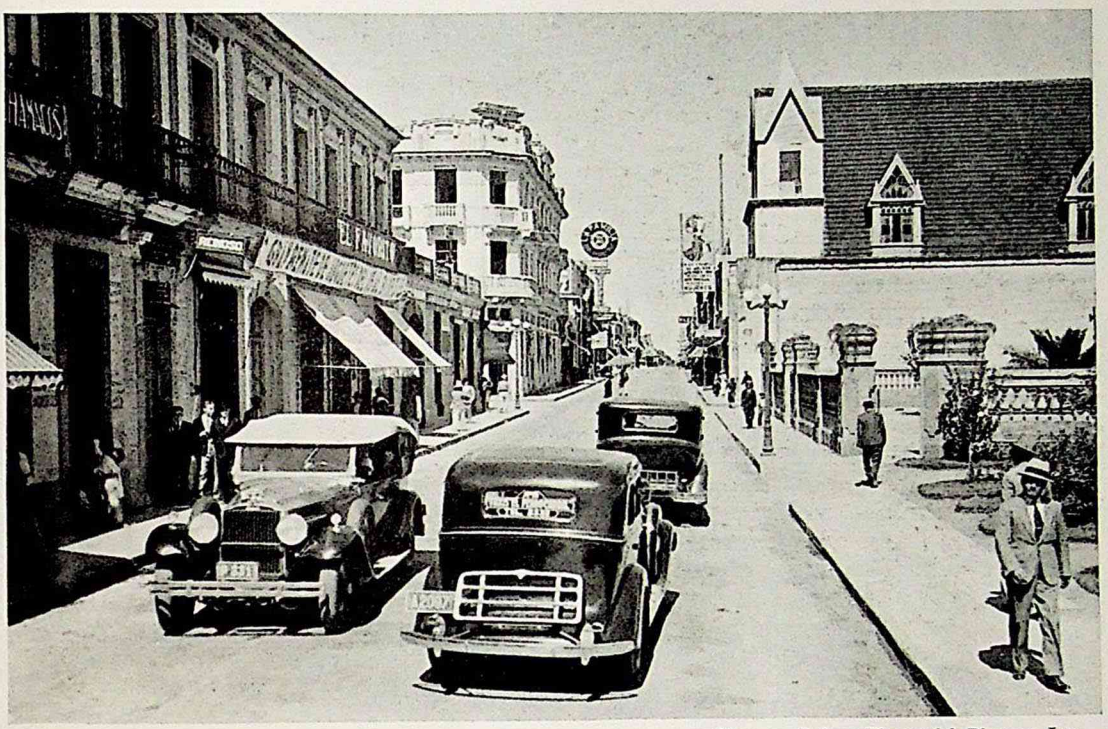
"I was the turkey of the feast" is a common Guatemalan expression when a person is the object of a practical joke. The boy playing in the market place with a strutting old gobbler entertains Chichicastenango visitors by doing the *son*, a dance popular throughout the Nation.



Photographs by Luis Marden

TIME OUT FOR LUNCH ON A BUSY DAY

An Indian family's current assets may be represented in this sow and two small pigs at the livestock market in Santo Tomás Chiché. If they are sold, the money may mean new clothing for everyone, or more furniture, or a christening for a baby.



Photograph from Fitzpatrick Pictures, Inc.

SIXTH AVENUE IS THE BROADWAY OF GUATEMALA CITY

With its busy shops, stores, hotels, banks, and theaters, this newly repaved thoroughfare is the focus of business and social life in the Capital. It is gayest in the late afternoon and early evening. Motion picture theaters advertise the latest Hollywood features with huge electric signs overhanging the streets. The "talkies" are in English, but Spanish subtitles are flashed on the screen.

I turned to Don Alfredo Clark, our host in the highland country, and questioned him about the delay.

"We have no traffic police in the mountains," he explained, "but we have a speed limit. Our time was checked here, and it will be telephoned to another control point down the road. If we get there too quickly, we'll get a ticket."

As our car sped along the floor of the valley, we passed a steady stream of Indians and vehicles bound for the markets of Guatemala City. Stolid, earnest-faced men trotted by at a half run, their heads held rigid by a tumpline across the forehead that supported the heavy loads on their backs. For miles they had been jogging along at this peculiar, forward-falling gait. In *cacastes,* or wooden frames, they carried goods of all kinds—earthen jars, furniture, bags of grain, or fresh vegetables (page 430).

Their women hurried along beside or behind them, arms swinging freely, their burdens on their heads. Sometimes it was a basket of live chickens, a fat roll of clothing, woven fabrics, or a bundle of firewood. Almost always a baby bobbed up and down in a shawl slung across the mother's back.

Suddenly Don Alfredo exclaimed: "Say, there's a group of Indians from Todos Santos, away back in the hills. They must want to see the President, because they never come here to trade."

When I asked how he knew they were from Todos Santos, he pointed to their peculiar costumes (Color Plate I).

"UNCLE SAM BOYS"

"We call them 'Uncle Sam boys,' (although they have never heard of Uncle Sam) because they have red and white striped trousers. Each tribe, and almost every village, in the highlands has a distinctive costume. Designs have not changed in hundreds of years. To those who know the different costumes, the Indians of the highlands might be carrying signs around their necks reading, 'I am from Sololá,' or 'I am from Chichicastenango,' et cetera."

It is regrettable, however, that many of these costumes are disappearing. Native garb has been replaced by blue denim and cheap imported cotton goods throughout

most of El Salvador, and these materials are now penetrating Guatemala. Under the harsh treatment of the Indian's daily toil, such fabrics are quickly reduced to tatters.

At the old Indian village of Mixco we climbed out of the valley and soon reached the crest of a long, broken range of mountains, fringed by the upward-sweeping cones of several volcanoes. Guatemala has been called a "Land of Volcanoes," and with reason, when one considers that it possesses nearly a score of large craters, of which at least a half-dozen are active (page 448).

VOLCANO-GIRT LAKE ATITLÁN

Steeper and steeper grew the grade as we left the hillside village of Godínez. Just before we reached the summit of the climb, the mountain dropped away to the left with breath-taking suddenness, and there, far below, lay the deep-blue waters of Atitlán, one of the world's most beautiful lakes (Color Plate II).

Like some of the Swiss lakes, Atitlán is folded among steep, rocky shores, but instead of snow-capped Alps in the background there are huge volcanoes—four towering brown and purple cones with fleecy white cloud turbans on their heads. Nowhere is the mountain rampart broken, for Lake Atitlán apparently has an underground outlet.

Directly below, in a cove along the shore, a yellowish patch indicated the village of San Antonio Palopó (St. Anthony Where Mats Are Made). Local guides will tell you that there are twelve Indian villages around the lake, each named for one of the Twelve Apostles. Map makers, less romantic, have found that there are many more than twelve towns and that only four of them bear names of Apostles.

The steep, narrow road descending the inner rim of Atitlán is a marvel of highway engineering, twisting and winding down to the rocky bed of a mountain torrent that enters the lake near the quaint village of Panajachel. But we continued on to Tzanjuyú, where a small inn has been built on a headland jutting out into the lake.

Before the vine-draped veranda of the inn a magnificent vista of sparkling water and volcano cones is spread—when the weather is clear. The afternoon we arrived a heavy tropical downpour like a silver curtain shut out the view. We were wondering how to pass the time when a fellow guest, a Guatemalan on vacation with his wife and family, asked if we would like something to read.

We gratefully replied that we would, and he returned a minute later with the latest issue of the NATIONAL GEOGRAPHIC MAGAZINE! When I explained that I was a member of the editorial staff, obtaining material for an article about his country, he added that he had heard Dr. Grosvenor, the President of the National Geographic Society, speak the previous evening. A short-wave broadcast, via Pittsburgh, Pennsylvania, had brought him The Society's program honoring Admiral Byrd and his gallant Antarctic companions in Washington, D. C.

Thus, far back in the rugged mountains of Central America, I learned about the most recent activities of The Society from one of its 371 members in Guatemala. On two other occasions, at Chichicastenango and at San Francisco el Alto, I met resident members of The Society, and in each instance my researches were made easier by their kindly cooperation.

Although Lake Atitlán is only 11 miles long and a little more than 6 miles wide at its widest point, three Maya tribal groups live around its shores. Near Tzanjuyú dwell the Cakchiquels, allies of the Conquistadores; directly across the lake the natives are the once warlike Tzutuhiles; while the Indians of San Marcos and San Pablo belong to the Quiché tribe.

Viewed from the water, Santiago Atitlán, chief city of the Tzutuhiles, with its straw-thatched stone huts rising in tiers from a bowlder-strewn shore, resembles a South Sea village. The town faces a blue bay between the graceful peaks of San Pedro and Tolimán Volcanoes.

WOMEN WEAR "HALOS"

Going ashore, we were met by women and children shyly offering textiles and pottery for sale. Others, carrying water jars on their heads, passed in endless procession up and down the rough stone lanes. In Santiago Atitlán the women wind a narrow, varicolored woolen ribbon around their hair like a halo (Plate VII).

On the return voyage in a motor launch to Tzanjuyú, a Guatemalan friend pointed out a V-shaped valley debouching into the lake.

"That is Jaibal, pronounced in Spanish like your American word 'highball,'" he explained. "But the only highball that





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Finlay Photographs by Luis Marden

NORTH AMERICAN VISITORS CALL THEM "UNCLE SAM BOYS"

Red, white, and blue costumes of the Todos Santos Indians suggest the cartoon character. Resemblance, however, is only accidental. The natives live in an isolated little village far back in the western highlands, and probably never have heard of "Uncle Sam." The four men (above) came into Guatemala City to see President Jorge Ubico; those below are selling potatoes at San Francisco el Alto.



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Finlay Photograph by Luis Marden

SLUMBERING VOLCANOES, THEIR HEADS PILLOWED IN CLOUDS, GUARD DEEP-BLUE LAKE ATITLÁN

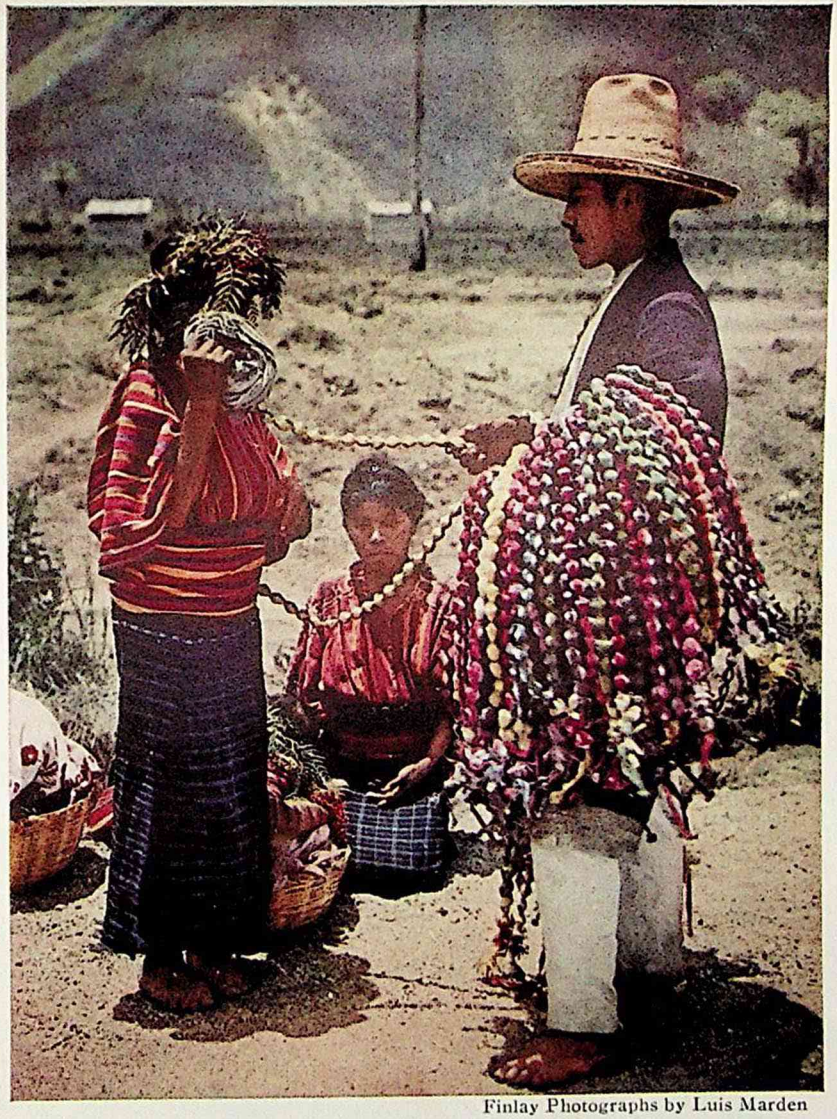
Nearly a mile above sea level, the largest body of water in the Guatemalan highlands here is overshadowed by Mounts Tolimán and Atitlán.



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HOMAGE TO A VILLAGE ELDER

Guatemalan Indians, like the Chinese, venerate age and family traditions. Here a policeman of Sololá kisses the hand of an old friend. Strangers can always spot a Sololá Indian by his red-striped sleeves and checkered knee-skirt, which the policeman wears but the other man carries folded.



Finlay Photographs by Luis Marden

FESTIVE GEAR FOR THE FIESTA

The strings look like garlic, but they are made of colored corn husks stuffed with pellets of sugar. The women are buying them near Lake Amatitlán for the "Fiesta de la Cruz." On holidays, buildings are festooned with paper, fireworks are set off, and often masked dances are staged.



EVERY VILLAGE HAS ITS "PILA," OR OUTDOOR LAUNDRY

Not all are as elaborate as this stone fountain in Antigua. In the tub clothes are soaped and pounded. Rinsing follows in the main pool. Heated water is sometimes piped from hot springs. Everywhere *pilas* are gathering places for gossiping women.



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Finlay Photographs by Luis Marden

GUATEMALAN FABRICS ARE HAND-WOVEN FROM ANCIENT PATTERNS

Women of San Antonio Aguas Calientes, meaning "St. Anthony of the Hot Waters," weave on the looms brilliant designs for new blouses. The finished material is smooth and resembles tapestry.



SWINGING CENSERS, INDIANS PAUSE FOR A PRAYER

Kneeling before the church portal, humble worshipers of Santo Tomás Chichicastenango display striking and bizarre costumes. An adaptation of 16th-century Spanish garb, the clothes are embroidered with sunbursts and other symbols.



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Finlay Photographs by Luis Marden

THE WEIRD CANDLE CEREMONY IN THE CHURCH OF SANTO TOMÁS

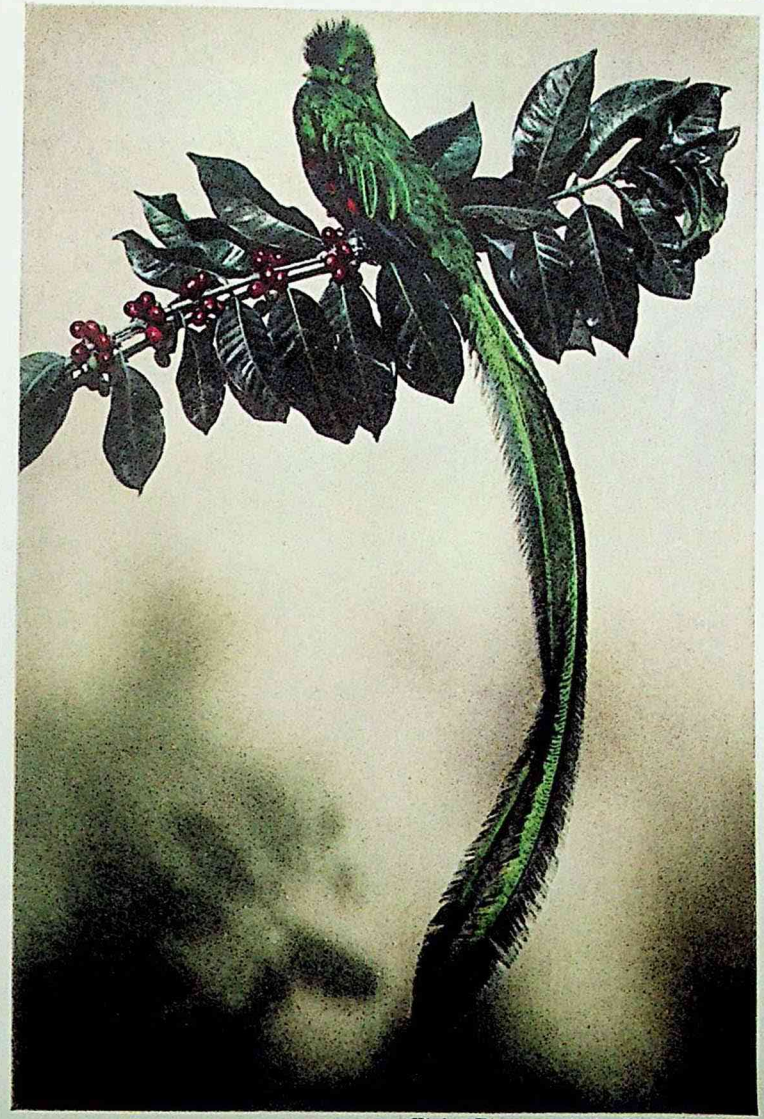
The head of the family (left) prays and gesticulates while he drops rose petals, corn, and small coins among the flickering tapers. Indians kneel for hours on the cold stone floor of the church.



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DON PEDRO DE ALVARADO, BRAVE AND RUTHLESS

After the conquest of Mexico, Cortez sent his bold lieutenant to search for gold in Guatemalan cities. A painting in the City Hall, Guatemala City.



Finlay Photographs by Luis Marden

THE QUETZAL IS THE SYMBOL OF GUATEMALAN FREEDOM

Its striking tail plumes were worn by Maya chiefs. Today it appears on the coat of arms, coins, and stamps of Guatemala. This museum specimen is perched on a coffee tree branch.



© National Geographic Society

Finlay Photograph by Luis Marden

PEACEFUL BARTERING NOW PREVAILS IN THE HOME OF GUATEMALA'S MOST WARLIKE TRIBE

Tzutuhiles proved so troublesome and hostile to Alvarado that he led a special expedition against them. Today Santiago Atitlán, their ancient capital, is noted for its comely Indian women, who wear "halos" made of tightly wound bands often 20 feet long.



© National Geographic Society

Finlay Photograph by Luis Marden

ONE OF THE ATTRACTIONS OF ANTIGUA IS THE CHURCH OF LA MERCED

Much of this former capital of Spanish Central America was destroyed by the disastrous earthquake of 1773. Shortly afterward, the seat of government was moved to Guatemala City. Founded in 1542, Antigua had, in the days of its viceregal glory, scores of splendid government buildings, churches, huge estates, fountains, and plazas. It bore the resplendent name, "The Very Noble and Very Loyal City of Saint James of the Gentlemen of Guatemala."

comes from there is coffee. Some of our best coffee is grown in that little ravine."

Nearly a thousand feet above Lake Atitlán, the Indian village of Santa Cruz clings precariously to the side of a mountain. From the lake its tiny cluster of creamy houses, huddled around a low, white church, looks for all the world like an egg salad on a generous portion of lettuce.

It was the situation of the village that first excited our interest. No one could tell us much about the place, except that its inhabitants were weavers and fruit-growers who toiled up a narrow trail to sell their wares at Sololá, chief city of the lake region.

The captain of the San Pedro boat agreed to drop us on the rocky shore below the village and call for us on the return trip. As his launch put-putted around a projecting headland, we climbed a steep, dusty trail that zigzagged up from thorny cattle corrals and lemon groves to the overhanging houses of the town.

THE FIESTA OF SANTA CRUZ

As we drew near, not a person was to be seen, in contrast to the venders and curious children who heralded our arrival in Santiago Atitlán, San Pedro, and the other lake villages. Then, as we walked around the corner of a building near the sun-baked plaza, we came to a sudden halt.

Ranged on each side of a glistening mahogany marimba were eight costumed and plumed Indians, peering at us through the eyeholes of as many bland and emotionless masks. Some carried sabers; others held decorated gourd rattles. All wore ill-fitting shoes and white stockings. Long feathers waved above spangled hats and velvet uniforms bedecked with gold braid, bits of mirror, and bright silk ribbons. We had stumbled upon a village fiesta (page 453).

Outsiders are rare in this out of the way place, and our presence caused an awkward pause; so we continued our walk.

At the head of the village we sat down on a stone threshing floor. But presently all thought of rest was banished. From somewhere below came the deep, lugubrious tones of a marimba. The music rose and fell in regular cadence, repeating over and over again a refrain that seemed to have no beginning and no end. In the cities there is something harplike and gay about marimba music, but out here, in this primitive volcano land, there seemed an undertone of drums, of the barbaric beating of tom-toms.

We went nearer, down a winding gully. The music grew louder. There was a slow, shuffling noise, too, as if feet were moving in regular rhythm, and the sharp rattling of stone-filled gourds.

A bend in the ditch revealed the sun-baked village plaza, a hundred yards below. There, before the marimba, the eight costumed Indians were gliding and prancing back and forth, now slowly, now quickly, in time with the music. There was something in the sight suggestive of an old Spanish-Mexican dance depicting the Moors and the Christians. Yet the steps were mincing, with a studied awkwardness and dragging gait that was as puzzling as it was fascinating.

A haunting spectacle it was—the eerie music, the movements, the brilliant costumes, and the little village hidden in the mountains. History's pages were turned back four hundred years.

The next day we left Lake Atitlán. The rough mountain road, which seemed a continuation of the steep roof of our hotel, twisted into rocky defiles and wound out to the brink of dizzy headlands (page 447).

GRADES OF MORE THAN 30 PER CENT

Rain, falling in torrents, added new thrills to the ride across the plateau from Sololá (Plate III) to Encuentros, where we crossed the highroad from Guatemala City to Quezaltenango. As we continued north toward Santo Tomás Chichicastenango, our chief objective in the highland country, the grades steadily became steeper.

Just before we left Guatemala City, a small bubble gauge had been attached to a door of the car to measure the grades. Unfortunately, however, it measured up to *only* 30 per cent! On several of the hairpin turns between Encuentros and Chichicastenango the bubble went to the top and stuck. But our powerful car, with its aviation-type tires slightly underinflated, never faltered. One may appreciate how steep are these Guatemalan roads by comparing them with the highway up Pikes Peak in Colorado, where the maximum grade is a little over 10 per cent.

Late in the afternoon we topped a pine-covered knoll and there below us lay Chichicastenango, a picture village of low white houses and wine-red tile roofs. All around it drop terrifying canyons, but the



Photograph by Luis Marden

YOUR MORNING CUP OF COFFEE BEGINS AS A SMALL WHITE FLOWER

The pale, delicate blossoms of the coffee plant give off a faint perfume, but they last little more than a day. This tree was photographed at the *finca,* or plantation, of the President of Guatemala, General Jorge Ubico, south of Guatemala City.

town itself is securely seated on a shelf overlooking the open Quiché plains.

Our road found a shoulder between two of the deep ravines and presently we were bumping along a narrow, cobbled street between whitewashed adobe houses. At each turn sandaled Indians and heavily laden burros scampered out of the way. Shy Indian faces peeped from the doorways. The tooting of the car's horn occasionally brought a friendly "Adiós" from a passing shopkeeper, for Don Alfredo is known and liked in this highland town.

Down a side street we drove, and turned into the courtyard of an inn, which, with its Spanish colonial furniture, stone fireplaces, crystal chandeliers, and carved woodwork, was a different world from the Indian village outside.

The walls of the patio were painted with queer inscriptions copied from the ruins of Uaxactun, a Maya city far to the north in the Department of El Petén (page 432). In the library of the inn, before a blazing fire, were the latest magazines and a collection of rare books describing the region.

That night we walked under a starless sky through silent, deserted streets. As the village offers nothing in the way of evening entertainment, we were surprised to hear a marimba playing "The Continental," a popular dance tune in the United States at the time.

The music seemed to come from a side street. Walking in the direction of the sound, we came to a small house. A dark passageway led to a tile-paved room, dimly lighted by flickering candles. Along one side were two marimbas, one large and played by four men, the other smaller, played by two. Beside the larger marimba stood the maestro, an elderly man with a huge bass viol. He explained that the boys were practicing for a village fiesta.

Cane chairs were brought and we listened entranced to several native compositions, deep, rhythmic, with much repetition of motif, and generally in a minor key.



Photograph by Luis Marden

A MOUNTAIN STREAM TAKES A TUMBLE OF SEVERAL HUNDRED FEET

One of the spectacular sights along the highway that twists down the mountainside from Sololá to Panajachel is this silvery ribbon streaking downward through the forest. Only part of it appears here; below the highway it continues its plunge. There are many such cascades in the Lake Atitlán region, where streams fed by tropical downpours leap over steep escarpments.



Photograph by Baron von Turckheim

"A PILLAR OF CLOUD BY DAY; A PILLAR OF FIRE BY NIGHT"

Santa María is one of Guatemala's most active and dangerous volcanoes. In 1902 it blew out its side in a tremendous eruption that took hundreds of lives and destroyed a half million dollars' worth of coffee and grain plantations. Again in 1930 it spread terror and death. Santa María's cone, like those of other Guatemalan volcanoes, is built up of ash. Much of the damage results from outpouring of sulphurous vapors and ashes rather than from extensive overflows of lava.



Photograph by E. John Long

"CRICKET BAT" PADDLES PUSH A HEAVY DUGOUT THROUGH GLASSY WATERS

Indians of some of the more primitive villages around Lake Atitlán are skilled navigators of these unwieldy craft with crudely carved prows and raised sideboards. Alvarado, the Spanish conqueror, mustered hundreds of such *cayucos* when he and his allies, the Cakchiquels, crossed the lake to subdue the warlike Tzutuhiles (page 436). Storm clouds gather over the serrated cone of San Pedro Volcano in the background.



Photograph by Luis Marden

YOUNG GUATEMALA GOES FOR A RIDE

In La Aurora Park, the Capital's playground, sons and daughters of Guatemalan families are led around walks shaded by palms, banana plants, and other tropical vegetation. An Indian nurse in native costume walks beside the youngster in the goat cart.

"How did you learn 'The Continental'?" I asked.

"We heard it on a phonograph record at the inn," the maestro replied. The Guatemalan has a keen ear for music and can reproduce difficult compositions after hearing them a few times.

A MARKET LIKE A STAGE SETTING

The next morning we were up early to see the teeming Indian market in the plaza. But we were not up early enough to get there before the Indians, who all night had been slipping noiselessly into town.

Chichicastenango's plaza is the scene of the largest and the most elaborately costumed Indian market in Central America. On Thursdays and Sundays it draws as many as 5,000 traders and farmers from an area of several hundred square miles.

Mingling here on market days are Indians from scores of villages, each dressed in a different manner. To the stranger it is dreamlike and unreal. One has the feeling that this is the opening scene of a new opera; that presently a trumpet will blow, an orchestra will begin to play, and all these earnest people will drop their bargaining to burst forth in full-throated song!

Back of the gay trappings and the romancing of visitors, however, the workaday life of a simple but industrious people moves on. In long rows the women squat on the hard earth, their wares piled before them. Some are protected from the tropical sun by square cotton awnings, but most of them sit in the open. Many plait straw for sombreros as they wait for buyers. Hand scales measure out yellow and blue corn, native copal incense, soap, peppers, dried shrimps, beans, and herbs.

ARISTOCRATS AMONG INDIANS

It is difficult for an outsider to understand the status of the Indian in a town like Chichicastenango. Unlike the half-naked aborigines of the jungle lowlands, or the itinerant tradesmen and servants of the



Photograph by E. John Long

"RAINY SEASON BRIDGES" KEEP PEDESTRIANS' FEET DRY

When torrential downpours begin in May, these folding footbridges are erected across many of the side streets in Guatemala City. On a corner of the building in the background is a small shrine, containing a vase filled with freshly cut flowers.

cities, the Indians of the highlands of Guatemala have maintained a proud, semi-independence as farmers, weavers, and pottery makers.

Conquered but never assimilated, they are aristocrats among the native peoples of Central America, and they are sufficiently well organized to make mass petitions to the central government when local conditions demand it. They have had much less contact with other races than Indians elsewhere have had, and are not badly scourged with alcohol. Consequently, they have retained their self-respect and are neither subservient nor cringing.

To students of the early races of Central America, Chichicastenango has another interest. In its convent was found a book, the *Popol Vuh,* written by a Christianized native shortly after the Conquest.

This rare document, describing Quiché history and mythology, the deeds of the hero gods of the Maya, and the Maya version of the Creation, survived the relentless campaign of destruction waged by the early Spaniards against all native writings or monuments only because it was hidden for many years.

As a record of the traditions and of the philosophical and religious beliefs of an ancient race, the *Popol Vuh* has been compared in some respects to the Japanese *Nihongi* and the Brahmanic *Rig-Veda.* Although it has been translated into Spanish and French, no one has published an English version of this remarkable book.

Roman Catholic, the little white stone church of Santo Tomás at Chichicastenango is also a Quiché shrine. The Indian's religion, as it is practiced here, may be considered an interesting example of the passage from half-forgotten pagan idolatry toward orthodox Christianity. To the stranger, Sunday worship at Santo Tomás is a compelling spectacle, because there can be no denying the fervor and deep sincerity of the Indian's faith, whether it follows accepted forms or not (Color Plate V).



Photograph by E. John Long

BLANKETS CARPET THE STREETS ON A MARKET DAY

To San Francisco el Alto are brought many of the best woolens of Momostenango and Huehuetenango, centers of the weaving industry of western Guatemala. Merchants spread their wares on the rough flagstones to dry and await the inspection of buyers. Selected wool from both black and white sheep is used in the preparation of the finest blankets made in the Republic.

Before I came to Chichicastenango, I saw photographs of stone idols half-hidden in little clearings in the pine forests. There, I was told, Indians still carry out the rites of their pagan ancestors. But I was a little skeptical of reports that such idols were reverenced today. The photographs did not show anyone around them, although, it was explained, this was because of Indian shyness or hostility.

One of the most famous of the ancient altars stands on a mountain top within a mile or two of Chichicastenango. With an Indian lad as a guide, I set out for the shrine along a well-beaten path that zigzagged up the steep mountainside through a forest of evergreens.

Pine needles muffled our footsteps, and, in the dead silence of late afternoon in May, I presently heard a chanting monotone, sometimes slow, sometimes fast and excited. The accent and words were strange, lilting—the language of the Indian. The pungent odor of copal incense filled the air.

In a few minutes we came to a clearing on the top of the mountain. There, directly ahead of us, knelt four Indians, facing a stubby, time-chipped and smoke-blackened stone image of a man with arms folded across his chest.

Between the four and the idol, an older man knelt on one knee, sprinkling flower petals around several rows of burning candles. It was he who was chanting, gazing all the time at the lighted tapers. Occasionally he leaned on a small stick, but most of the time he made short, forceful gestures with his hands, much as did those praying within the church at Chichicastenango.

There was no intimation that the group was hostile. On the other hand, I sensed a strange uneasiness.

Later, when I described the costume worn by these Indians, I learned why the



Photograph by E. John Long

SULLEN RAISING OF MASKS GREETS THE WHITE VISITORS

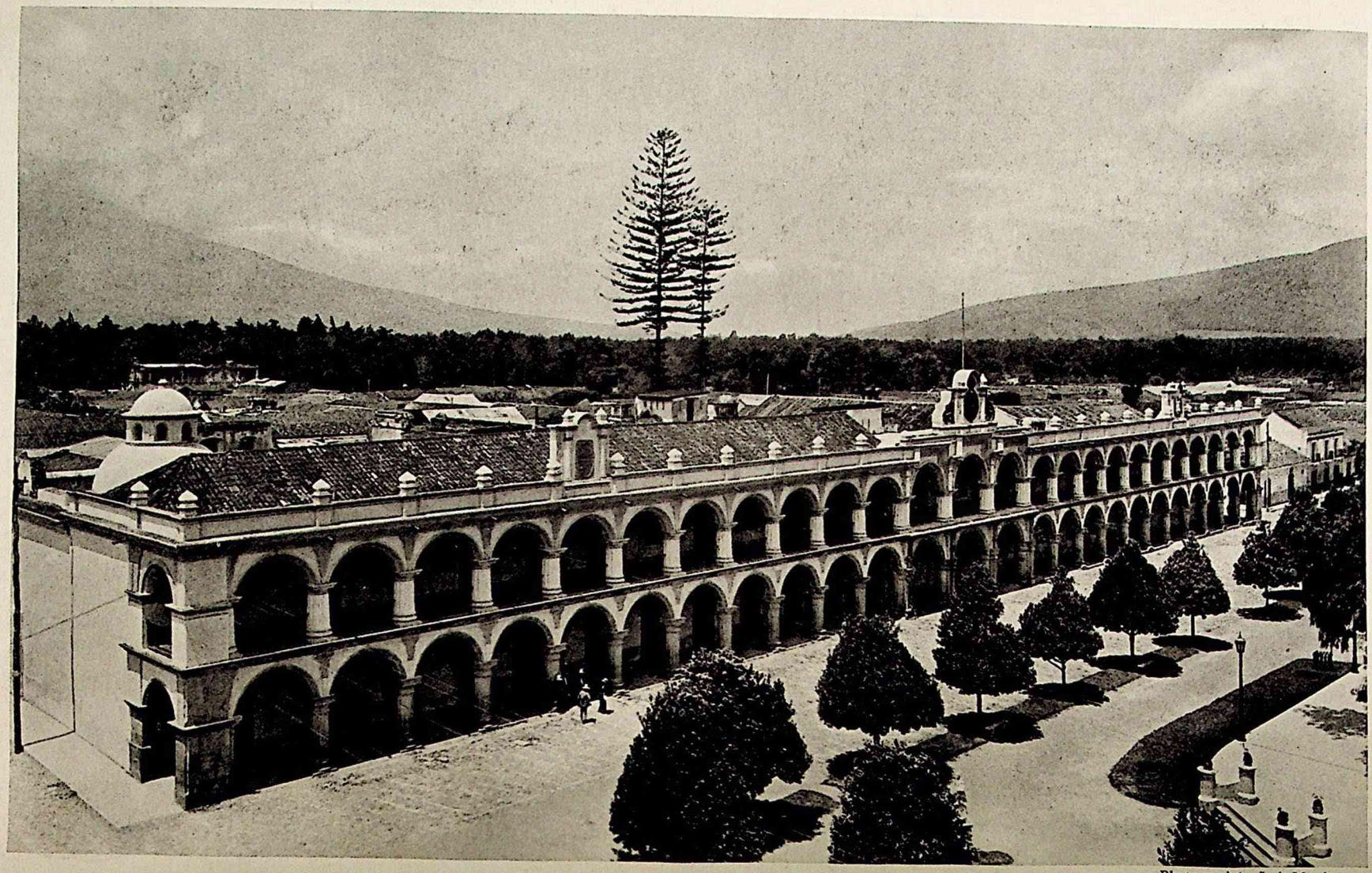
When the author chanced upon a village fiesta at Santa Cruz, the costumed Indians suddenly stopped their strange dance (page 445). The bespangled leader (second figure to right of the marimba) wore a sword, but he directed the proceedings with a bulging umbrella.



Photograph by Luis Marden

MASK DECORATORS PLY AN ANCIENT TRADE

In highland villages Indians make and rent masks and costumes for ceremonial dances. Here an artisan of Santo Tomás Chichicastenango retouches a mask representing a Conquistador.



Photograph by Luis Marden

MAJESTIC STILL IS THE PALACE OF THE CAPTAINS GENERAL AT ANTIGUA

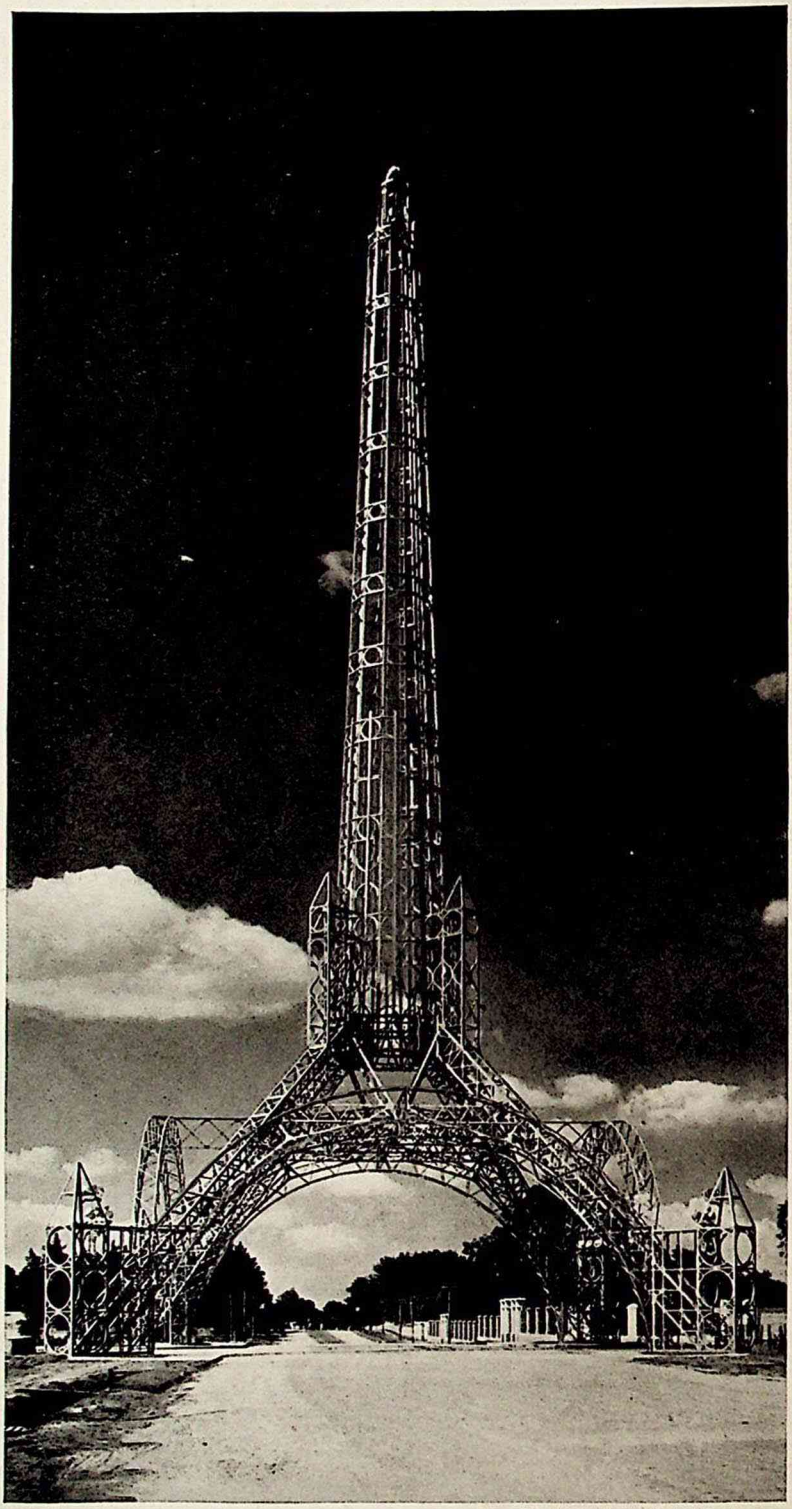
The royal coat of arms of the ancient city, carved during the reign of Charles III of Spain, surmounts this imposing Spanish Renaissance building, one of the finest colonial structures in the Americas. Within its cool halls and audience chambers once centered governmental activities for a vast domain stretching from southern Mexico to Panama (page 458). From its upper balcony officials and their guests watched pageants and bullfights in the Plaza de Armas (right).



Photograph by George W. Hutchison

A FLEET OF MOTORCARS FINDS SHADE UNDER THE SPREADING CEIBA TREE AT PALIN

One of Guatemala's busiest and most colorful Indian markets is held every Wednesday and Friday beneath this giant natural canopy, which has a spread of more than 180 feet. During the annual fiestas in July and October one may see masked dances and comic mock bullfights in this little plaza.



Photograph by Luis Marden

GUATEMALAN PROGRESS POINTS A FINGER SKYWARD

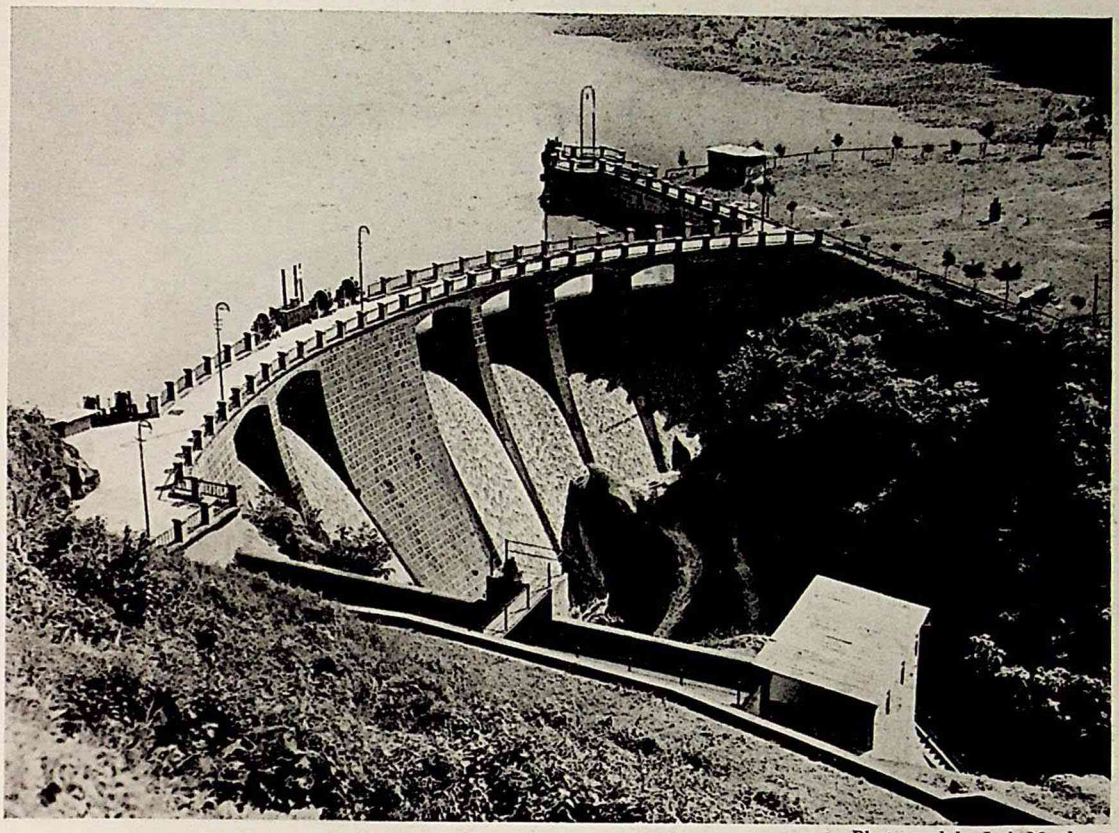
Built in 1935 to honor former President Justo Rufino Barrios, this aviation beacon spans the highway entering Guatemala City from La Aurora Park and the municipal airport (page 433). Barrios became President in 1873 and during his long rule built railroads, telegraph lines, bridges, and highways. His ambition was to establish a single state in Central America.

group had been so restless. They were Sololás, traditional enemies of the Indians of the region. Chichicastenango Indians use an effigy of a Sololá Indian for Judas during their Easter fiesta, and the figure is blown up during the celebration.

The evening before we left Chichicastenango I walked again in the plaza at twilight. The Indian traders had gone, and it seemed strangely lonely. The smooth white walls of the little church of Santo Tomás held the last faint rays of the setting sun; the incense fire at the foot of the church steps was only a smoldering ember.

Presently an old man walked up to the church and planted a piece of wood in a crevice of the steps. Taking a brand from the dying fire, he touched it to the stick and—whoosh! bang! a skyrocket ascended and exploded over the center of the plaza. He was announcing, in the time-honored way, that a *cofradía*, or Indian council, would be held the next day.

The rest of the world seemed far away, and my thoughts drifted back to the glamorous days of the Quiché empire, when their glittering cities rose from the hilltops and their nobility marched out in



Photograph by Luis Marden

"WHITE COAL" NOW LIGHTS GUATEMALA'S SECOND LARGEST CITY

The Santa María dam, near Quezaltenango, was so sturdily constructed by Indian laborers that it has outlived the electric railway for which it was originally built. The railroad was abandoned a few months after completion when heavy rains washed out a large section of track (page 458). Visitors in this region are often amazed to find electric light bulbs burning brightly in mud-walled jungle huts.

savage splendor to collect tribute from vassal tribes.

Then suddenly I heard the expression "Foul ball!" in English behind me. Turning around, I saw a group of Indian boys at play. One held a club in his hand and another was throwing something that looked like—yes, it was a baseball! I wasn't so far from the world I knew, after all.

North of Chichicastenango new highways have opened up a vast, little-known country. It is but an hour's run now to Santa Cruz Quiché, the modern town nearest to the ruins of Utatlán.

Utatlán was the capital of the fighting Quichés. Before the Spanish Conquest, it must have been a magnificent city of stone, timber, and mortar, resplendent with carved monuments. The flat-topped mesa on which it stood was bordered on two sides by deep gorges, but to the north and east fertile farms fell away along rich plains, protected by several outlying watchtowers.

The only approaches to the walled city itself were a narrow causeway that could be easily defended and a steep, narrow path along the cliffs.

TRAP SET FOR ALVARADO

At Gumarcah (the true Quiché name for the town) Pedro de Alvarado, leader of the Spanish expedition that conquered Guatemala, had his narrowest escape (Plate VI).

Alvarado entered Guatemala overland from Mexico in 1524. At Quezaltenango he defeated 30,000 Guatemalan Indians with 120 horsemen, 200 infantry, four pieces of artillery, and a host of Mexican allies.*

Realizing the hopelessness of fighting against men who rode great beasts and

* See "To Bogotá and Back by Air," by Charles A. Lindbergh, NATIONAL GEOGRAPHIC MAGAZINE, May, 1928.

commanded the gods of "lightning and thunder," the Quichés resorted to strategy. Feigning friendship, they offered Gumarcah to Alvarado as headquarters. It was their design then to wreck the causeway, set fire to the houses, and destroy the Castilians and their fearful horses.

But a timely warning saved Alvarado. Pretending that his men had to lead the horses out to graze, he quickly retired from the city. With the assistance of the Cakchiquels, jealous rivals of the Quichés, he later returned, vanquished the defenders, and razed their beautiful capital.

From Santa Cruz Quiché to Totonicapán the highway is another succession of ups and downs. Part of the route follows an old Spanish trail. Still in use are ancient, humpbacked stone bridges, more suited to horsemen or oxcarts than streamlined motorcars. Once or twice we scraped the crankcase with an excruciating noise when it failed to clear the sharp crest of a bridge.

WASHOUTS CONQUER A RAILWAY

Near Quezaltenango, the second largest city in Guatemala and commercial center for the western part of the Republic, the highway crossed a railroad right of way choked with weeds—sad reminder of an ill-fated electric line, built a short time ago at a cost of many millions of dollars to link Quezaltenango with the International Railways of Central America. It was abandoned a few months after completion when heavy rains washed out a large section of track.

On the return trip to Guatemala City we retraced our route to Encuentros, where we picked up the main highway to the capital. This road clings to the summit of the Sierra Madre, and at Chichoy Pass is about 9,000 feet above sea level.

In the car with us was a Chichicastenango Indian youth, who wanted to see the capital of his country. It was his first automobile ride, and for a long time he was silent. We thought he was frightened, until we noticed a greenish pallor under his bronze skin and great drops of perspiration on his brow.

Don Alfredo guessed the difficulty, and an emergency stop was made. The lad was carsick, but his spartan Indian nature would have forced him to sit in painful silence had his predicament not been noticed. Yet this youngster could pack 100 pounds on his back and dogtrot thirty miles or more a day over these steep grades.

It was night when we finally reached the rim of the mountain overlooking Guatemala City. The rain had stopped. Like a bowlful of fireflies, the lights of the Capital glittered in the dark valley far below.

Don Alfredo shook the Indian lad, whose car sickness had left him in a coma, pointing out the glorious spectacle he had come so far to see. But he smiled wanly and went back to sleep. No need to worry about transporting him back to Chichicastenango when he had tired of life in the big city; it was a safe wager he would walk!

FLOWER OF COLONIAL CIVILIZATION

Circumstances forced us to postpone our visit to Antigua, the finest of the colonial capitals, until the end of our Guatemalan visit. Antigua, as one of the flowers of Spanish civilization in the New World—comparable to Lima, old Panama, Santo Domingo, and ancient Mexico—is truly the scenic, architectural, historical, and romantic climax of a Guatemalan interlude.

As the highway leveled out into a deep valley, where Antigua is swung like an oriole's nest between Agua Volcano, on one hand, and a steep, forested mountain range on the other, coffee plantations closed in on each side. It was the beginning of blossom time, and the shady groves were aglow with delicate, snow-white flowers (page 446).

A stone cross, dating from 1618, marked our entrance into the old capital. Antigua was the third seat of government under the Spaniards. After the first capital, at Tecpán, became untenable, a second capital was built a short distance southwest of Antigua in 1527. But a violent gale and heavy rains, followed by a landslide of rocks, mud, and water from the steep slopes of Agua Volcano destroyed it overnight. Today a tiny village called Ciudad Vieja marks the site of this tragic second venture.

Antigua dates from 1542, when it received its coat of arms as "The Very Noble and Very Loyal City of Saint James of the Gentlemen of Guatemala."

For more than two centuries the city flourished, in spite of occasional temblors, whose sullen warnings went unheeded. Architects, artists, and craftsmen vied with one another to give it magnificent public buildings, plazas, and half a hundred glorious churches (Color Plate VIII).

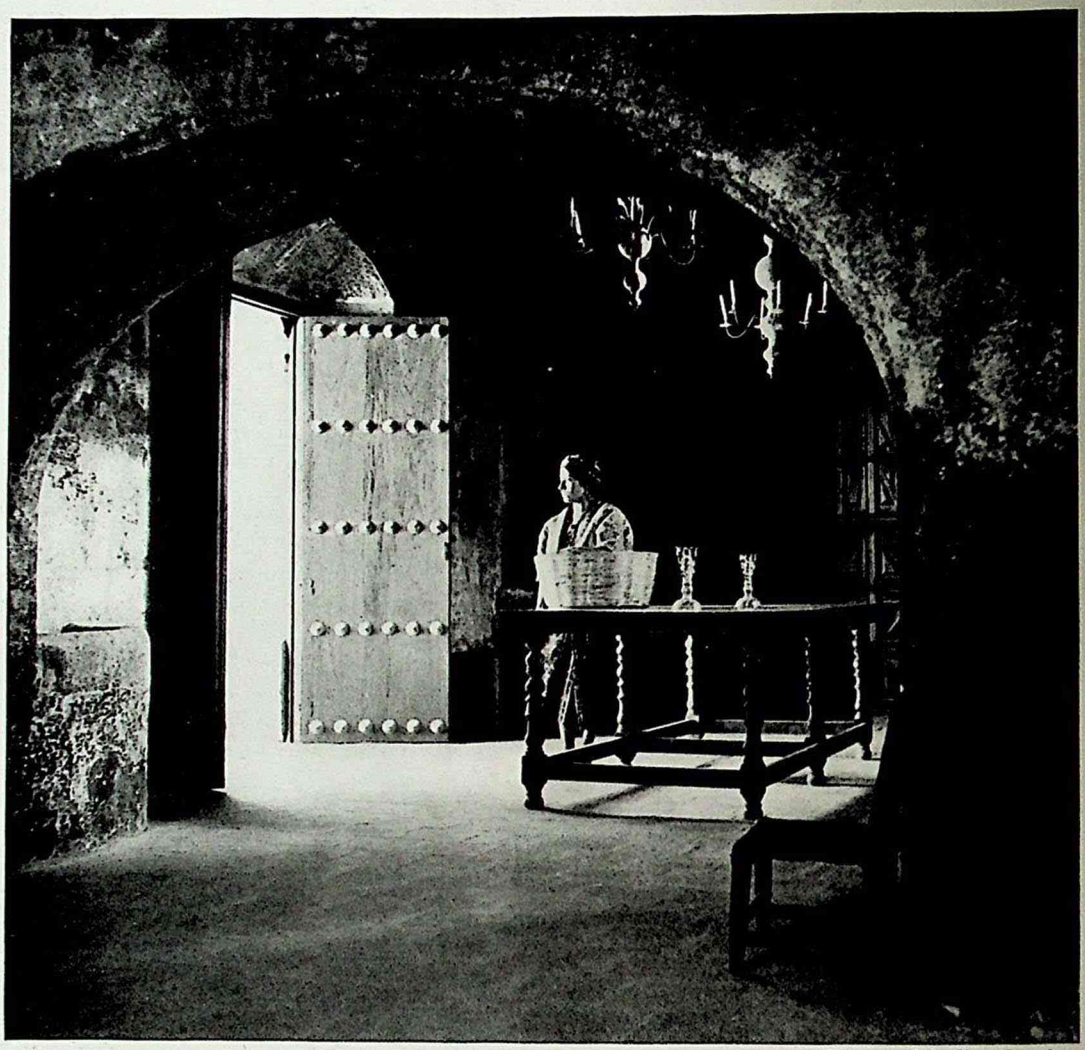
Lovely Spanish señoritas in laces, Spanish grandees in velvets, Spanish priests in embroidered vestments, and swashbuckling Conquistadores, at their sides the keen



Photograph by Luis Marden

DEEPLY CARVED COLUMNS FLANK THE EXQUISITE FAÇADE OF LA MERCED

Perhaps because this fine church was newer and sturdier than most buildings in the old capital, Antigua, it was easier to repair after the great earthquake of 1773. The adjoining monastery of the Mercedarians, now largely in ruins, possessed one of the most magnificent fountains in the Americas (Color Plate VIII).



Photograph by Kurt Severin

SCENE OF MANY A VICEREGAL FEAST IN "THE POMPEII OF AMERICA"

Iron-studded wooden doors creak on rusty hinges as they swing open to reveal the smoke-grimed kitchen of one of Antigua's magnificent colonial homes. This ancient mansion was restored by the late Dorothy Hughes Popenoe, wife of Dr. Wilson Popenoe, distinguished American botanical explorer.

Toledo blades that were carving out an empire for Spain in the New World—all played their parts on Antigua's stage when New York was but a rude village and Chicago still undreamed of.

Then came the earthquakes, twelve of them, and the outpouring of dreadful night from the throats of volcanoes. The populace, rich and poor, grandee and Indian alike, ran crying into the streets as heavy tile roofs and stout beams quivered and collapsed. Ashes and cinders buried gardens and plantations, choked fountains and streams. In 1775 the King of Spain ordered the removal of the capital to its present site in the valley of Las Vacas River.

Much that was glamorous in this "Pompeii of America" is today but overgrown ruin. Enough remains, however, to recall the quondam beauty of the capital that was. Between broken palaces and crumbling churches a new, but smaller, city has been built, and in the ruined cloister of the Convento de las Capuchinas, Indians gather again to sell their fruit and handicraft.

Roaming its cobbled streets today, one feels that many, many months could be spent in Antigua, and that every day would disclose some new tale or memento linked with the ancient splendor, and tragedy, and intrigue, and romance of this "Very Noble and Very Loyal City," which once ruled a glamorous empire reaching from southern Mexico to the Isthmus of Panama.

GAME BIRDS OF PRAIRIE, FOREST, AND TUNDRA*

By Alexander Wetmore

Assistant Secretary, Smithsonian Institution

THOUGH dawn was approaching, the blackness of night still lay over the wooded mountains of eastern Tennessee. With a mountaineer companion, I came quietly along a little path where near-by trees and bowlders were mere shadows against the sky, to the shelter of a windfall beside an opening in the forest.

We seemed so isolated from familiar things that my hand, resting on the rough bark of our sheltering log, brought a reassuring touch of reality in a world hidden in dim obscurity. The air was cold with the damp, penetrating chill of early spring.

A gray light that came slowly among the trees strengthened gradually until the wooded slopes about were dimly visible. Color touched the edge of distant clouds.

At that moment we heard low calls and then a rapid gobbling that made me quicken with tense excitement. Wild turkeys, traced to their roosting trees the night before, were coming to the ground.

My friend, skilled in woodland lore, with his turkey call began low notes in answer. As the birds continued, his imitations became louder and more varied, their invitation more urgent. The tone was deceptive even to me close beside him, and I listened with admiration for his skill.

Daylight now came quickly, so that my eyes no longer strained at shadows. Robins called and scolded from trees below, a Carolina wren sang, and in the distance I heard the loud drumming of a great pileated woodpecker. The turkey calls continued.

Soon dark shapes came walking quietly over the open ground before us. A little group of hen turkeys was approaching, pecking at the ground, and stopping constantly to look about with vigilant eye. The intermittent gobbling of the cock was louder, and in another instant he appeared.

PRIDE BEFORE A FALL

With spread tail, head drawn back, feathers erect, wings drooped, and body swollen, he strutted proudly before the seemingly indifferent hens. Light shone from the bronzed feathers of his back and breast. The bare, wattled skin of his head was red and purple, and his tail was tipped with brown. Truly he was a magnificent creature (Color Plate I and page 468).

So intent had I become on the great birds that I had forgotten my hunter companion entirely, and the roar of his gun startled me almost as much as it did the turkeys. The hens disappeared instantly, running and flying among the trees, but the splendid gobbler lay prostrate where he had fallen at the shot.

In another moment I was admiring his rich colors and examining with interest the five-inch "beard" of hairlike plumes pendent from his heavy breast. His legs were armed with sharp-pointed spurs, and a fleshy wattle dangled from his forehead.

A half hour later, as we started home with the twenty-pound bird, we saw hen turkeys crossing a distant field while other gobblers called belligerently from the valley below.

In those days of abundant game it was considered entirely proper to hunt the turkey in early spring. In fact, this was the only time when the wily gobblers were to be found except by chance. Wisely planned game laws now restrict this sport to other seasons.

MOST IMPORTANT GROUP OF BIRDS

The great group of fowl-like birds (the Order Galliformes), to which the turkey and its relatives belong, is widely distributed through all the continents of the world and is the most important order of birds so far as man is concerned.

More than eight hundred kinds are known, ranging in size from the tiny oriental quail, no larger than a sparrow, to huge turkeys and long-tailed pheasants. Four of the seven families of the order are found native in North America, and members of a fifth, indigenous in the Old World, have been introduced in our continent.

The turkey (Family Meleagrididae) is the principal contribution of the New World to the domesticated birds kept by man. Captive turkeys were found among the Indians in abundance on the discovery of

* This is the fifteenth article, with paintings by Maj. Allan Brooks, in the notable Geographic series describing the bird families of the United States and Canada.

Mexico and were brought to Spain in 1519. From there they spread rapidly through Europe. Although at first a luxury, before the close of the century turkeys were a regular article of table fare among the better class.

PUEBLOS RAISED TURKEYS FOR FEATHERS, NOT FOOD

The Pueblo Indians of the Southwest kept turkeys in numbers long before the coming of the white man. At Pueblo Bonito, explored by a series of expeditions of the National Geographic Society, and at most of the other large pueblos that have been excavated, rooms were assigned to turkeys, as is indicated by the abundance of their bones.

These captive birds were kept not for use as food but for their feathers, which were used in ceremonial offerings to Indian deities. To the Pueblo Indians the turkey was a sacred bird and was seldom eaten.

The ordinary domestic turkey of the farmyard still shows its Mexican ancestry in the white or buffy-white tips on tail and rump feathers. This is a characteristic of the Mexican bird, these markings being brown in the race native to the eastern United States.

The only other living species of this family is the handsome ocellated turkey, of excellent flesh for the table, found from Yucatán to British Honduras and northern Guatemala. Seemingly this bird, of beautifully iridescent plumage, does not thrive in captivity, and is not known to have been domesticated except in a casual way.

A BIRD CALL HEARD A MILE AWAY

The low, mud-walled ranch house at Kilometer 80, west of Puerto Pinasco in northern Paraguay, is pleasantly located on the shore of a lagoon. The land about is level, with grass-grown prairies interspersed with groves of low trees.

After long hours afield during the morning, I sat each afternoon under the split palm roof of a broad porch, caring for specimens and writing. The heat at times was intense, tempered somewhat by warm winds that blew from the north.

At intervals from the forest there came a raucous, three-noted call that was given rapidly for several seconds. Immediately this was repeated from a distance, and often two or three of these voices called back and forth at intervals for an hour.

In walking along narrow forest trails, amid a dense ground growth of spiny plants, I sometimes caught sight of long-tailed birds, pheasantlike in form, that rested in trees or, rarely, fed on the ground. To them I traced the harsh calls that carried to the house, sometimes from a distance of a mile.

These were chachalacas (Family Cracidae), of a group that is common in the American Tropics. One kind comes north across the Rio Grande (Plate I and p. 468).

The species of this family differ from other fowl-like birds of our fauna in living almost constantly in trees. They are marked by having the hind toe on the same level as those in front, to assist in perching, instead of elevated to a higher level as in the grouse, quail, and the domestic fowl that live mainly on the ground. In addition to the chachalacas, the family includes the curassows, which are as large as turkeys, and the guans.

ONE OF A HUNDRED KINDS OF GROUSE

Above the village of Painscastle in southern Wales the hills rise in rolling, heath-grown moors that lie open to the summer sun. These elevated slopes are the home of the red grouse, famed as game, and the only distinct species of bird confined in its range entirely to the British Isles.

One warm July evening, in company with a friendly gamekeeper, I walked out through bracken and heather, eagerly anticipating my first sight of so renowned a bird. At one side was the traditional "keeper's larder"—a long pole, supported on two uprights, from which were suspended numerous carrion crows, a magpie or two, a kestrel, and a stoat. All had been killed by the keeper as "vermin" in his zeal to protect the game ranging the broad acres under his charge.

We passed several places where butts had been built of sod. In these, gunners stood in the shooting season to fire at the grouse driven by beaters.

Red grouse feathers were scattered about in abundance, but the day had been hot and birds lay close. I recognized the calling of male grouse from distant coverts at the first note, as the call is similar to that of the willow ptarmigan, but not until the keeper returned to the house for a dog did we find a bird.

As the dog, with waving tail, ranged through the bracken, a fine male grouse burst out suddenly with a startling roar



Photograph by Hamilton M. Laing

FRANKLIN'S GROUSE, OF WESTERN MOUNTAIN FORESTS, SHOWS NOT THE SLIGHTEST FEAR

There are many tales of killing them with sticks or stones, or of shooting several from a flock, one by one, without alarming the others. They may even dodge missiles thrown at them, merely shifting position a bit without troubling to fly (page 483 and Color Plate VIII). This one posed for its picture in southern British Columbia.



Photograph by Arthur A. Allen

A POMPOUS WOODLAND DON JUAN DRUMS ON HIS FAVORITE LOG

By following the thunderous, far-carrying roar of his whirring wings, advancing when it is heard and halting when it stops, one may sometimes see a ruffed grouse in the act of drumming (Color Plate VI and page 479).



Photograph by Hamilton M. Laing

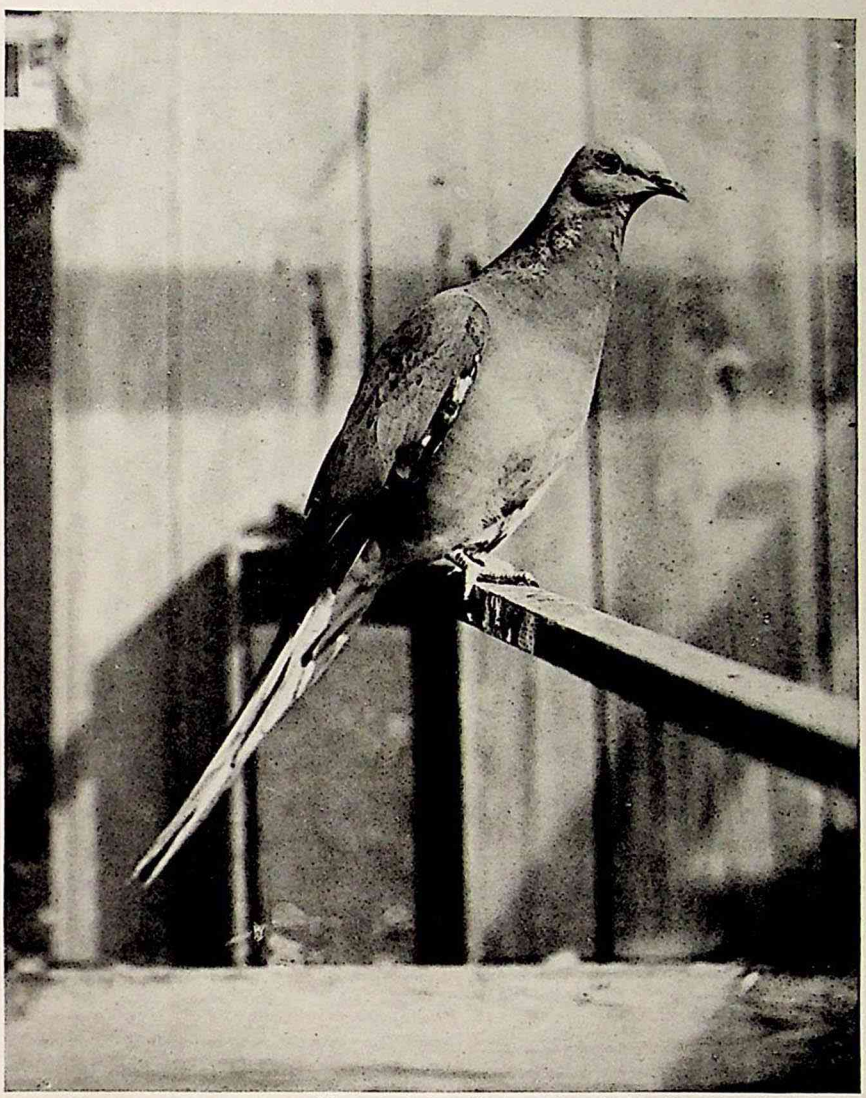
A TWO-DAY-OLD CALIFORNIA QUAIL MAKES LESS THAN HALF A HANDFUL

But its feet and legs are well developed, for these—together with its natural camouflage—are its only means of escaping danger. Chicks of this species have been known to run from the nest with pieces of the egg from which they were hatched still clinging to their backs. California quail raise large families (Color Plate V and page 478).

of wings. As it sailed swiftly away, I had a fine view of its handsome red-brown markings and heard its cackling call. It was followed immediately by others.

The grouse (Family Tetraonidae) are birds of the North, none of the hundred or more forms being found in the Tropics. In the Old World the black cock, the capercaillie, and the hazel grouse are representative of this well-known group, which includes also the ptarmigan and various grouse of North America (Color Plates VI-XIII).

In the mountains of northern Spain I found poachers hunting the capercaillie at night during the pairing season. Under the light of the moon the males call sonorously. They are said to close their eyes when calling, and by moving only when the note is heard it is possible to approach these shy birds near enough to shoot. At other times it is extremely difficult to see them.



Photograph from National Association of Audubon Societies

THE LAST SURVIVOR OF INNUMERABLE HORDES

This passenger pigeon, photographed in the zoological gardens in Cincinnati, lived in captivity for years after its myriad wild companions had vanished forever from the earth. When it died at 1 p. m., on September 1, 1914, one of the world's most remarkable birds became extinct (page 495 and Color Plate XV).

SOME PHEASANTS HAVE FEATHERS FIVE FEET LONG

The great group that includes the pheasants (Family Phasianidae) has more than 550 races distributed widely through the world. The domestic fowl, in this family, is without doubt the most valuable bird commercially that exists. Some of its relatives among the pheasants are strange and beautiful almost beyond the imagination of one who has not seen them.

The largest individual feathers in the entire group of birds are found in members of this family. The decorative upper tail coverts of the peacocks, spread as a huge fan in display, are good examples, but even these are dwarfed by the tail feathers of Reinhardt's pheasant of Indo-China, which measure more than five feet in length and between five and six inches in breadth. The

bird is an inhabitant of jungles, where it is seldom or never seen except when caught in snares.

It seems truly marvelous that such huge feathers, with their beautiful colorings, can be shed and renewed annually by birds with relatively small bodies.

Among the true pheasants, the common pheasant and its varieties are the most widely known. Originally the abundant common pheasant is supposed to have come from the ancient lands of Phasis, on the southeastern shore of the Black Sea; hence its name. It was well known to the Greeks and Romans, and may have been introduced into England during Roman occupation.

The pheasant is now one of the most important game birds of the world, as it is widely distributed in Europe and has been established in many localities in the United States. Hundreds of thousands are reared annually in captivity and then released to be hunted, and equally large numbers breed in a state of freedom.

In England pheasants are driven by groups of beaters past hunters stationed at strategic points. In America they are hunted with dogs, as are other upland game birds.

The rearing of pheasants for pleasure as well as for sale is now widespread and extends to many species. In recent years the great eared pheasants of western China, formerly known to few persons, have become common in captivity. Large aviaries often contain twenty or thirty species of pheasants of remarkable variety and beauty of plumage.

The story of the quails that fed the Israelites in danger of starvation in the barren wilds of Sinai is well known to readers of the Bible. These were the small Old World quail that migrate south in winter to Africa and then return north into Europe in spring. In passage they are caught in nets by the thousands and shipped to European markets. So many have been taken that it has been necessary to regulate the practice by law.

JUNGLE PIGEONS IN WHITE CAPS

Before the cooling sweep of the trade wind, my little boat traveled easily across the head of Samaná Bay in the Dominican Republic. Terns and pelicans fished in the water, and flocks of screeching parrots passed over the green hills back of the shore.

Entering the mouth of the Yuna River, which drains the great valley called the Vega Real, I was soon in a heavily wooded swamp where the shade was a grateful relief from the intense rays of a tropical sun.

A huge sedge, eight or ten feet high with spreading head, grew along the river bank. On either side stretched the dense green jungle with trees hung with vines and parasitic plants.

As I walked cautiously over the muddy forest floor, dozens of birds flew out overhead with loudly clapping wings and darted away over the trees. These were white-crowned pigeons, found here in greater abundance than in any other place I have been. Their guttural cooing came constantly to my ears, but in spite of their abundance I found it difficult to see them among the dense and heavy leaves.

From the balcony of the little hotel in Sánchez, all through the afternoon, as I wrote or cared for specimens, single birds and flocks of these pigeons crossed from the swamps to the wooded hills. At a distance they appeared entirely black until, as they turned, the light caught the white crown cap that gives them their name (Plate XIV).

BOTH PARENTS GIVE "PIGEON'S MILK"

The group of pigeons and doves (Family Columbidae) has more than eight hundred forms distributed through all the great continents and spread widely in the islands of tropical seas. The best-known member of the family is the common pigeon, native originally in the Old World. This species was domesticated many centuries ago and has been carried by the white race throughout the world.*

Although raised extensively on a commercial basis, the pigeon, or dove, often ranges in a state of semi-freedom about barns and outbuildings. In every large city, flocks of them have reverted to a wild state, and live and nest about the ledges and towers of buildings, as they do about the rocky cliffs of their native habitat in Europe.

As one peculiarity, young pigeons, when first hatched, are fed on a substance called "pigeon's milk," which comes from the crop of both male and female birds. This is an easily digestible, creamy fluid formed by a fatty degeneration of the walls of the crop.

* See "Man's Feathered Friends of Longest Standing," by Elisha Hanson, NATIONAL GEOGRAPHIC MAGAZINE, January, 1926.



Photograph by Arthur A. Allen

WITH ROUGH TRACKS AND HOLES IN NEW-FALLEN SNOW, MOTHER NATURE OFFERS A WINTER RIDDLE

The observer trained to read her subtle handwriting would know that here a ruffed grouse plunged under the white, protective blanket to pass a cozy night. This is sometimes dangerous, as frozen sleet during the night may form a solid sheet and imprison the birds until they starve.

The most beautiful species of the group are the fruit pigeons of Polynesia and the Malay countries.* In almost innumerable variety these display pleasing and unusual combinations of yellow, green, orange, and red, in varying shades and patterns. The orange dove (*Chrysoena victor*) of Fiji is deep, brilliant orange with an olive-green head. The handsome bleeding heart pigeon of the Philippines is named from a sanguinary spot of red spreading over the feathers of the breast.

Among living members of the group the largest are the great goura pigeons of New Guinea, the size of a domestic fowl. The crown has a filamentous crest which once was used so extensively for hat ornaments that the stately birds were in danger of extermination. The importation of these feathers into the United States and many other countries is now prohibited by law through the efforts of those interested in conservation.

* See "Romance of Science in Polynesia," by Robert Cushman Murphy, NATIONAL GEOGRAPHIC MAGAZINE, October, 1925.

THE DODO, EXTINCT SINCE 1681, WAS RELATED TO THE PIGEON

Larger than the gouras was the curious dodo that once lived on the island of Mauritius, a bird of the pigeon order but in another group (Family Raphidae). The dodo was the size of a large goose, and had a heavy, hooked bill. Being unable to fly, it was soon exterminated by the sailors who invaded its haunts, so that the last living one was recorded in 1681.

Turkey

(*Meleagris gallopavo*)

The wild turkey, as the largest American game bird of its group, has enjoyed a renown that has come to few species of birds (Color Plate I and page 461).

At the time of the discovery of the New World, turkeys were abundant through much of the vast area between eastern Mexico and New England. Because of their numbers and their excellent meat, they were a regular source of food to the Indians and became at once of importance to the early colonists.

As they were tame, they were killed with little difficulty and were a fair mark for the Indian with his bow. At this time the birds were said to range in large bands.

The introduction of guns made an immediate impression on their abundance. In 1672 in Massachusetts, turkeys were reported in lessened numbers, but as late as 1717 they are said to have sold in Northampton at a shilling fourpence each. In 1788 the price had increased to threepence a pound and about 1820 it became tenpence and more.

The turkey in a wild state ranges in extensive woodlands, where it is so shy that one may enter its haunts frequently without once seeing a bird. In large areas of their former range, both in New England and elsewhere, turkeys have now been completely exterminated. Where they persist they are carefully protected as game birds, and where there is sufficient wild land to afford them cover they may still exist in numbers.

Hundreds are killed each year in Pennsylvania during a short hunting season, and the birds are equally common in many areas in the South. A few remain in Virginia within a few miles of the city of Washington, though their presence is made known mainly through their tracks and the birds are seldom seen.

In spring the adult gobbler struts and gobbles in display before the hens (page 461). At this season a heavy pad of fat develops over the breast in the male, serving to sustain the bird, which is so occupied in display that he neglects to feed.

The wild turkey is polygamous. The nest, made by the female, is a hollow scratched in the ground, under cover of a log, dense brush, or other shelter. It is lined with grass or a few leaves, and contains from 8 to 15 cream-colored eggs spotted with reddish brown and lilac. The female covers the eggs carefully with leaves and grass when she goes off to feed, to protect them from crows and other marauders.

When the young turkeys hatch after four weeks of incubation, they are tender and delicate, and in wet seasons many are lost. They range with the mother through the summer and fall. The adult gobblers flock together, mainly apart from their families, during this period. When the young can fly, all roost in trees, often varying the sleeping place from night to night.

During the day the birds range on foot, feeding on acorns, berries, and in the warmer seasons on insects. Although they range mainly in the woods, they may enter open fields. Unless suddenly disturbed, they seldom fly except to reach their roost.

Ordinarily, grown turkeys range from 12 to 16 or 20 pounds in weight, while occasionally old gobblers weigh 30 or even 40 pounds. The male turkey has a spur on the side of the tarsus, or lower leg, above the toes, and is marked in addition by a pendent tuft of hairlike feathers called the "beard" in the center of the breast.

In adult birds this becomes five to ten inches long, so that it trails on the ground as the birds bend forward in feeding. Occasionally old hen turkeys develop beards.

Four varieties of the wild turkey are recognized, ranging from Pennsylvania and Colorado to Florida and Mexico.

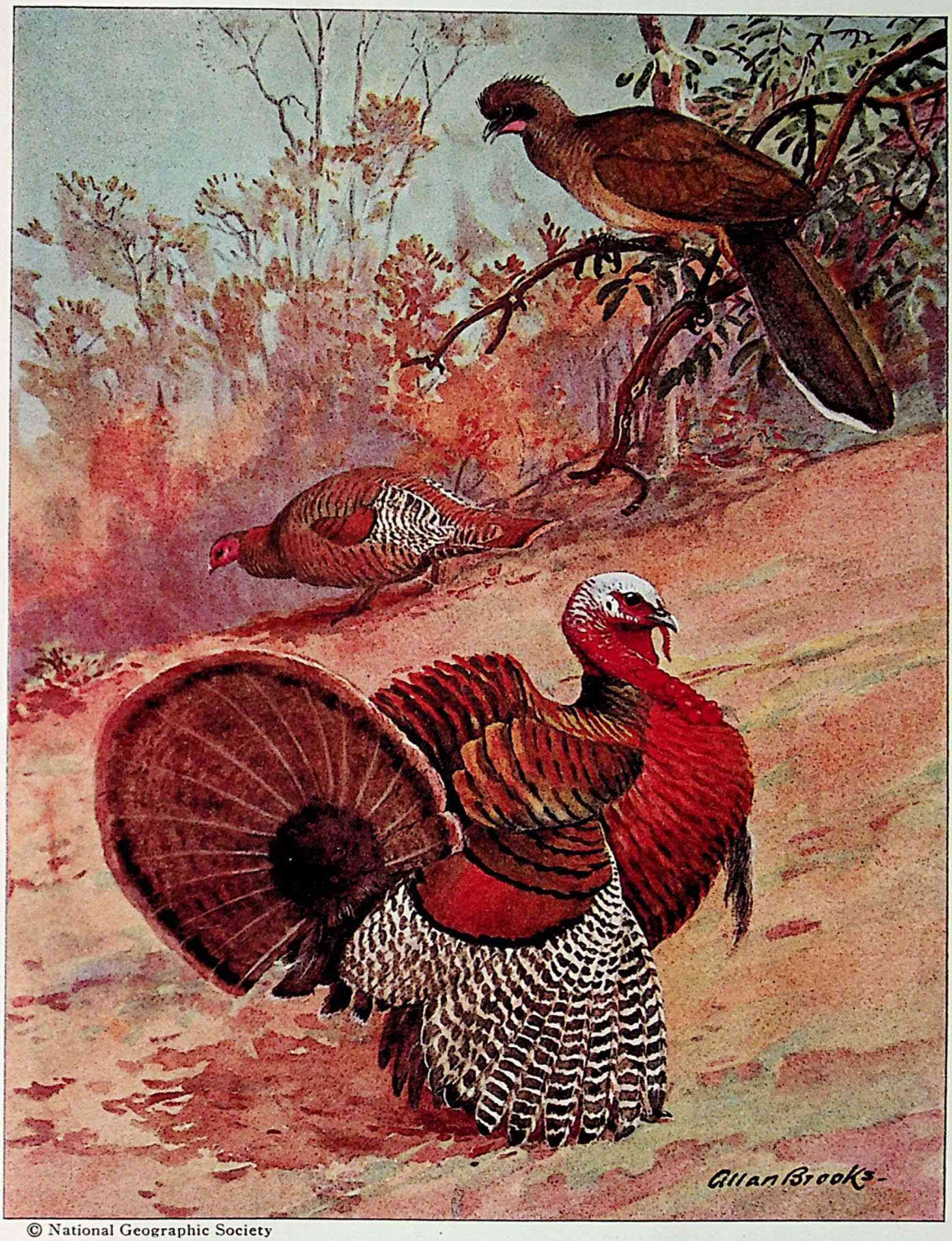
Chachalaca

(*Ortalis vetula vetula*)

Chachalacas live largely in the treetops, coming to the ground occasionally to feed, but retreating instantly to the branches at any alarm. Except to rise to such cover or to escape from isolated trees, they seldom fly far, preferring to run along the larger limbs. They are adepts at hiding and often disappear in seemingly scanty tree growth in a most astonishing manner (Color Plate I and page 462).

A nest of sticks and moss is made in a tree, often on the end of a broken stub. Usually three eggs are laid, though four or five are found rarely. These are buffy white, with an extremely hard shell that is finely corrugated and rough to the touch.

Eggs of the chachalaca are often hatched under hens and the chicks are easily tamed. In fact they often become a nuisance, as



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THE WILD TURKEY, BARNYARD BRED, HAS BECOME THANKSGIVING'S SYMBOL

In all his bronzed and brilliant glory, a big WILD TURKEY gobbler struts and scrapes the ground for the edification of one of his wives in the background, who seems wholly unimpressed. From this one hundred percent American bird the common domesticated turkey of holiday tables has descended. Once friendly and seemingly stupid, the wild turkey has been "educated" by hunters until it is now among the most suspicious and unapproachable of all game birds. In the tree is the elusive CHACHALACA of southern Texas and northeastern Mexico, which lurks in woods and dense chaparral. Through a U-shaped loop in its windpipe the male produces a resonant, far-carrying call.

they fly and climb everywhere and are continually in mischief.

The chachalaca is found in mesquites and chaparral in the lower Rio Grande Valley in Texas, ranging south to Veracruz. Related races and species extend through tropical America to Argentina.

Ring-necked Pheasant

(*Phasianus colchicus torquatus*)

From where I rested in the pleasant warmth of the morning sun at the edge of a vineyard in western New York State, the land led down steeply to the blue waters of Canandaigua Lake. Beyond the lake a mosaic pattern made by cultivated fields, pastures, and woodlands was displayed in broad panorama on the rising slopes of the opposite hills. Robins and field sparrows were singing, and barn swallows circled overhead.

Suddenly I heard a curious crowing note, followed by a quick beating of wings. As this was repeated I turned cautiously to see a gorgeous male pheasant posing at the edge of a thicket, with the red wattles about his eyes resplendent in the sun (Color Plate II).

As I watched he crowed again, and then, taking alarm, disappeared behind the bushes.

This is an alien species, now well established and thriving in many parts of our country. In Europe pheasants have been kept in captivity for hundreds of years. The Greeks at the time of Alexander the Great reared them for food, and this propagation was continued in the days of the Roman Empire. Henry VIII employed a pheasant breeder in 1502, and the birds are now bred extensively in many countries.

The true pheasant (*Phasianus colchicus colchicus*) has no white ring about the neck. The Chinese, or ring-necked, pheasant (*Phasianus c. torquatus*) and the Mongolian pheasant (*Phasianus c. mongolicus*) have the neck ring well developed. These three have been much mixed in breeding, and in addition have been crossed at times with the dark, greenish-colored Japanese pheasant (*Phasianus versicolor*), so that the ordinary wild stock is of hybrid blood.

Pheasants were taken to America as early as about 1790, when one-time Governor Wentworth of New Hampshire is said to have imported several pairs from England. These and other early stocks soon died out, however, and successful establishment of the birds came nearly a century later.

In 1880 Judge O. N. Denny, United States Consul General at Shanghai, shipped Chinese pheasants to Oregon, where they were liberated near the mouth of the Willamette River. The following year he sent another shipment, which was freed in the Willamette Valley in Linn County.

The birds established themselves at once, and increased so rapidly that when their hunting was permitted in 1892 fifty thousand birds are said to have been killed the first day.

Pheasants have been widely distributed in the United States by game commissions of the various States and are now established over large areas.

The long tail, coupled with the size, distinguishes both sexes of the pheasant from any of our native birds. Pheasants feed regularly in cultivated fields and meadows, but at any alarm run to safety. It is astonishing to see so large a bird disappear completely in apparently scanty cover.

To the American hunter the pheasant is often a disappointment, as it moves before the dogs and is often flushed with difficulty when it has sufficient shelter.

The cock pheasant crows mainly during the spring and early summer, though heard occasionally in fall. The birds are often, but perhaps not always, polygamous, and incubation normally is the duty of the female.

The nest is a slight hollow scratched in the ground under cover of vegetation. The eggs ordinarily are olive brown, though occasionally sets are found that are pale blue. They usually number from 8 to 13 and hatch in from 23 to 25 days. Captive females often lay continuously for considerable periods.

At present the pheasant is established throughout much of the northern half of the United States, and in British Columbia and Ontario. It is resident, and if food is available it can withstand severe cold in winter.

European Partridge

(*Perdix perdix perdix*)

This species, known often as the Hungarian partridge, has been introduced widely into the United States and Canada, and in various localities has now estab-

lished itself definitely as a game bird, particularly in the prairie regions of the Dominion (Color Plate II).

In Alberta, where the original stock was only 800 birds, conditions proved so excellent that a season for shooting partridges was opened five years after their introduction. Now they are common in Alberta, Saskatchewan, and parts of Manitoba.

In favorable regions they fairly swarm; W. B. Mershon reports more than a thousand seen in one October day. Sportsmen journey annually from England to hunt them, so abundant have they become.

With this success in mind, game commissions to date have released more than a quarter of a million of these partridges in various parts of the United States. They are now well established in Oregon, Washington, and Idaho, and are common in Wisconsin and Ohio. In other areas the experiment as yet is not wholly successful, but it is probable that the range will be considerably extended.

In the Old World the European partridge frequents cultivated lands, often where cover is scant. In America it has prospered most in sections devoted to fields of wheat and corn, interspersed with hay meadows and occasional areas of waste land.

In such haunts go afield some bright day in October, when the air is sharp with cold. In a weed-grown field, without the slightest warning, there is a sudden explosion of birds as twenty dark-gray forms rise together with roaring wings, and with tremendous speed dart away to new cover. The effect of a first meeting of this kind is more startling than any other I have experienced.

In spring these partridges separate in pairs. The nest is a little hollow in the ground, sometimes under shelter of bushes, but commonly in open meadows where it is sheltered by green vegetation. The 9 to 20 olive-brown eggs are placed on a slight lining of leaves and grass. Occasional sets are whitish or blue in color.

European partridges remain in coveys except during the pairing season, feeding and sleeping on the ground. Their tremendous speed on the wing and their secretiveness make them excellent game birds, and they are capable of thriving under conditions unfavorable to the native grouse of the prairie regions.

In its native home this partridge ranges over the greater part of Europe, including the British Isles.

Bobwhite

(*Colinus virginianus*)

As our two bird dogs ranged a weedy field in the rolling hills of southern Pennsylvania, they suddenly froze into motionless pose, with head forward and one front foot slightly raised.

We advanced carefully, with muscles tense, until, with a roar of wings, a covey of quail burst out in bunch formation, spreading instantly as they headed toward distant coverts (Color Plate III).

With ready gun I fired at a bird slightly to one side, and as it dropped I watched the others sailing with set wings over the crest of a little hill two hundred yards away. Others had fallen to the guns of my companions, and in a moment the birds, retrieved by our eager dogs, were in our hands.

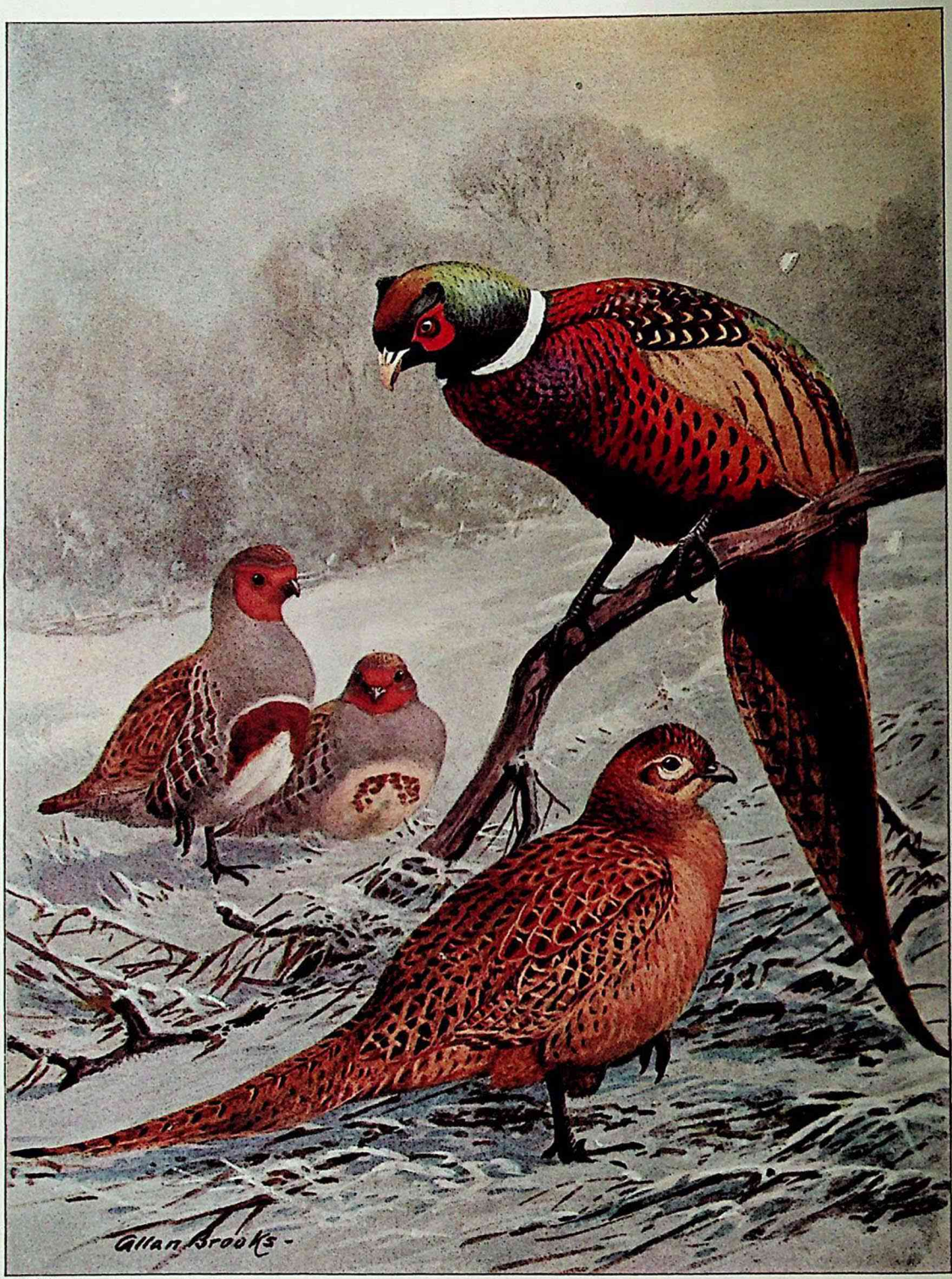
My own bird I examined carefully to determine that the covey was one of the native quail and not of the Mexican variety that had been introduced in large numbers into this country. To examine the status of these introduced birds was my mission on this particular expedition.

The bobwhite, ordinarily called "quail" in the Northern States and "partridge" in the South, is without doubt the best known of our upland game birds. It has wide range over the eastern half of the United States and in this area is a familiar inhabitant of fields and meadows, often living adjacent to farmyards.

During a large part of the year bobwhites range in coveys that often include members of several families. During the day these bands travel on foot through open fields or in the adjacent woodlands, walking quietly when somewhat protected by cover, or running rapidly, with neck erect and crest feathers slightly raised, as they cross little openings.

Flush them and they dart away to distant cover, from which, if there is no further alarm, in a few minutes they begin their "scatter" call, and under this guidance gradually reassemble. Whistle a good imitation of this call and a bird or two may come in nervous alarm almost to your feet.

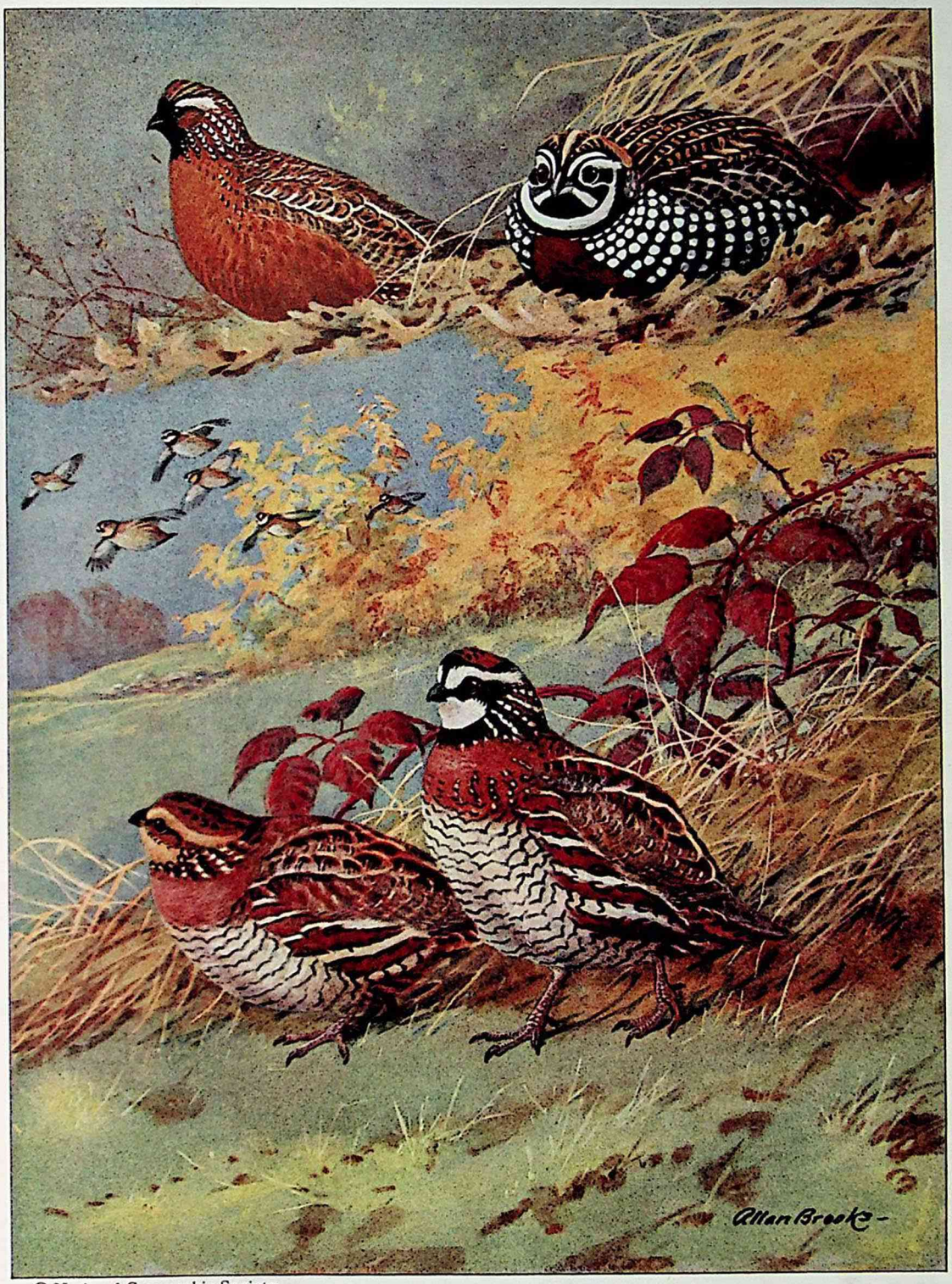
Toward evening the covey enters some thick cover, often in a weedy field, where the birds spend the night. To sleep they arrange themselves in a compact circle, with heads out and tails toward the center, resting closely against one another for



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ORIENTAL BLOOD PREDOMINATES IN A BRILLIANT WHITE-COLLARED IMMIGRANT

The showy RING-NECKED PHEASANT on the dead branch is of hybrid stock. Brought to America, these long-tailed birds are reared for game, for aviaries, and for fancy food markets. Ideal pheasant country has groves with underbrush and high grass, reed-sheltered pools, open fields and pastures. The modest female in the foreground contrasts sharply with the gaudy male (above). A dark, chestnut-brown horseshoe on the breast identifies the EUROPEAN PARTRIDGE (left, with his mate). This whirring flyer has been introduced in large numbers in the United States.



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FARMERS WELCOME CHEERFUL BOBWHITE, EATER OF INSECTS AND WEED SEEDS

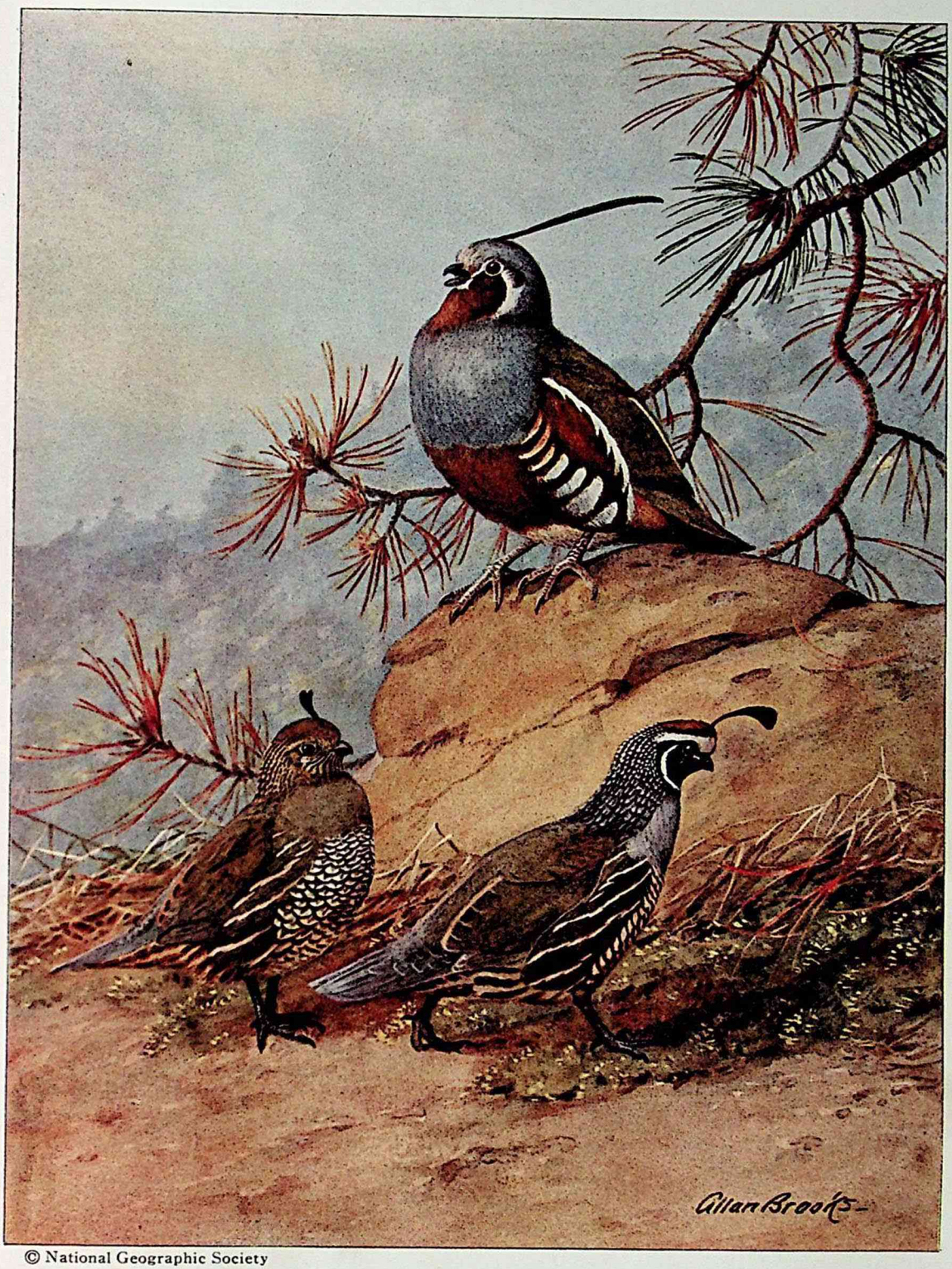
Northerners name him "quail" and southerners "partridge," but the BOBWHITE (right foreground with his mate) christens himself by his unmistakable call. This familiar inhabitant of eastern meadows is a shrewd game bird and a joy to the epicure. The odd-looking MEARNS'S QUAIL (upper right) is alert and wary throughout most of its range in the American Southwest and northern Mexico. The MASKED BOBWHITE (upper left), unable to cope with advancing agriculture, is now found only in northern Mexico, though it formerly frequented southern Arizona as well.



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THORNY SHRUBBERY PROTECTS DESERT QUAIL FROM ENEMIES

Dwellers among mesquite and cactus, these southwestern members of the family rarely take wing when flushed, but sprint to safety under spiny undergrowth. The plumed GAMBEL'S QUAIL, on the rock with his mate, lives in desert regions of the southwestern United States and northern Mexico. Across the foreground, seeking their dry fare of dusty weed seeds and scrawny insects, comes a pair of SCALED QUAIL, whose coveys range over both arid and irrigated lands from Arizona to Texas and from southern Colorado to the Valley of Mexico.



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IN THE FAR WEST LIVES THE LARGEST OF AMERICAN QUAIL

Upland districts of the Pacific coast from Washington to central California are inhabited by the big, handsome MOUNTAIN QUAIL (on the rock), which wears a long plume and utters a clear, plaintive call. Flocks of these birds walk down the mountain trails into the valleys when winter chills the heights. A favorite game bird in the West is the CALIFORNIA QUAIL (foreground pair), which posts sentinels while the flock is feeding or dusting. A single nesting each year is the usual thing in the quail family, but broods are large.

Though ordinarily shy, they are sometimes found in the irrigated lands of ranches, and then, with quiet trust in their human hosts, may come about the very door.

The nest is the hollow usual among quail, scratched in the ground and lined with bits of such vegetation as is conveniently at hand. The 9 to 16 eggs vary from white to buff and are spotted with brown.

The chestnut-bellied scaled quail (*Callipepla s. castanogastris*) is found from southern Texas to Tamaulipas and Coahuila. The Arizona scaled quail (*Callipepla s. pallida*), with the abdomen buff instead of brown, ranges from central Arizona and western Oklahoma to Sonora and Chihuahua.

Mountain Quail

(*Oreortyx picta*)

On the ground beside a spring in the Greenhorn Mountains of California, I saw brown feathers handsomely marked with white, indicating the presence of the mountain quail for which I searched (Plate V).

A moment later a low call came from one side, and I went out carefully through dense cedars until finally I saw a brown bird with gray breast standing beside a log. As he called he nodded his head, shaking the long, graceful plume that formed his crest.

Others, hidden in the brush, ran with a pattering sound over dry leaves. At an alarm all dashed across a little opening, with heads erect and crest feathers streaming in the wind, and when safe behind cover flew with whirring wings to a distant shelter.

This species, known sometimes as "plumed quail" or "mountain partridge," is one of the most handsome of its group, both in its color and in its decorative crest. Male and female are alike, except that the female usually has a shorter crest and slightly duller colors.

The nest is a hollow in the ground, lined with grass, leaves, pine needles, and other vegetation. Usually it is placed beneath the overhanging cover of logs, rocks, or bushes. The eggs are reddish buff without markings, and vary from 5 to 15 in number. Rarely there are more. In the lower part of their range the birds sometimes lay in the nests of the valley quail.

Family parties of mountain quail spend the summer quietly, being often found about little springs at the heads of gulches. In the higher mountains in September the birds become restless, and come down the slopes to spend the winter below the region of heavy snows. This migration is performed on foot. The birds follow ridges or at times come out on mountain roadways, walking and running in little companies.

This quail, in fact, usually trusts to its legs to escape its enemies, and grown birds seldom rise in flight until they can do so behind a screen of bushes. Hunting them, over the steep mountain slopes that they inhabit, is accompanied by much hard labor. With most sportsmen they are less in favor than the valley quail.

While these quail pick up some grasshoppers and other insects, the bulk of their food is composed of various seeds.

The coveys break up in spring and the birds begin their mating in late March or early April. Those that have come from higher altitudes to winter at lower levels usually return singly or in pairs, traveling upward as the snow disappears.

The mountain quail (*Oreortyx picta palmeri*) is found from southwestern Washington near the coast to Monterey County, California. It has been introduced on Vancouver Island.

Another race, called in books the "plumed quail," but known universally as the "mountain quail" (*Oreortyx p. picta*), somewhat darker in color, ranges from northwestern Oregon along the Sierra Nevada and inner Coast Ranges through California and to western Nevada. The paler colored San Pedro quail (*Oreortyx p. confinis*) occurs in the Juarez and San Pedro Martir Mountains of Baja California.

California Quail

(*Lophortyx californica*)

To Californians this sturdy-bodied quail with jaunty crest is the most familiar upland game bird. During most of the year it ranges chaparral-covered slopes in the mountain foothills, or brush-grown draws and thickets in the lowlands, in flocks that vary in size according to the extent the birds are hunted (Color Plate V and p. 464).

Though these quail run swiftly, they ordinarily hide when alarmed, to burst out with disconcerting suddenness on loud whirring wings and to dart away so swiftly that they are safe from all but those adept in handling guns.

In the early years of settlement these quail were very abundant; flocks of hun-

dreds were not unusual. They still remain common, but, through cultivation and grazing in their haunts, coupled with much hunting, they are reduced in numbers, so that their bands now ordinarily include from ten to fifty individuals.

The birds are highly adaptable, and with increased settlement have established themselves in many places in suburban gardens and even in parks in some cities. The eastern bird lover, visiting in southern California, may be thrilled by seeing handsome male quail calling from roofs or chimneys in the residence section of Pasadena, or may encounter pairs or little bands in the shrubbery of Golden Gate Park in San Francisco.

This quail has proved adaptable to transport elsewhere, so that I have been delighted to hear its pleasant notes in the Salt Lake Valley in Utah, on the island of Oahu in Hawaii, and near Valparaiso in far-distant Chile. In the eastern United States, however, attempts to naturalize them thus far have failed.

The nest is a hollow, usually hidden beneath some cover. On a lining of grass and other soft materials there are placed from 6 to 28 eggs. When more are found the nest is used by two females. The eggs are white or cream color, spotted with brown, and, like other quails' eggs, are strongly pointed at the smaller end. They hatch after 21 to 23 days of incubation.

Though nests are found from spring to fall, only one brood is raised. The later broods are believed to be those of birds that have lost an earlier setting. It is quite well established that in exceptionally dry seasons these quail remain in bands through the summer, and that under such circumstances many do not nest at all.

The California quail is one of the most strictly vegetarian of our birds, as approximately 97 per cent of its food is made up of seeds and other vegetable matter. Its flesh is tender but firm and it is excellent eating.

The typical California quail (*Lophortyx c. californica*) is found from southwestern Oregon near the coast to Monterey County, California, and has been introduced in the State of Washington and on Vancouver Island. The valley quail (*Lophortyx c. vallicola*), which is lighter colored, ranges from Upper Klamath Lake, Oregon, through California to northwestern Baja California. The Catalina quail (*Lophortyx c. catalinensis*), like the last but larger, is confined to Catalina Island, and there are two additional races in Baja California.

Ruffed Grouse

(*Bonasa umbellus*)

Admiring the view from the slopes of Spruce Knob, highest mountain in West Virginia, I suddenly sensed rather than heard a slow, throbbing sound, like the beat of a great heart. This was repeated, at first slowly, then with increasing speed, until it became a muffled roar of sound that ceased as abruptly as it had begun.

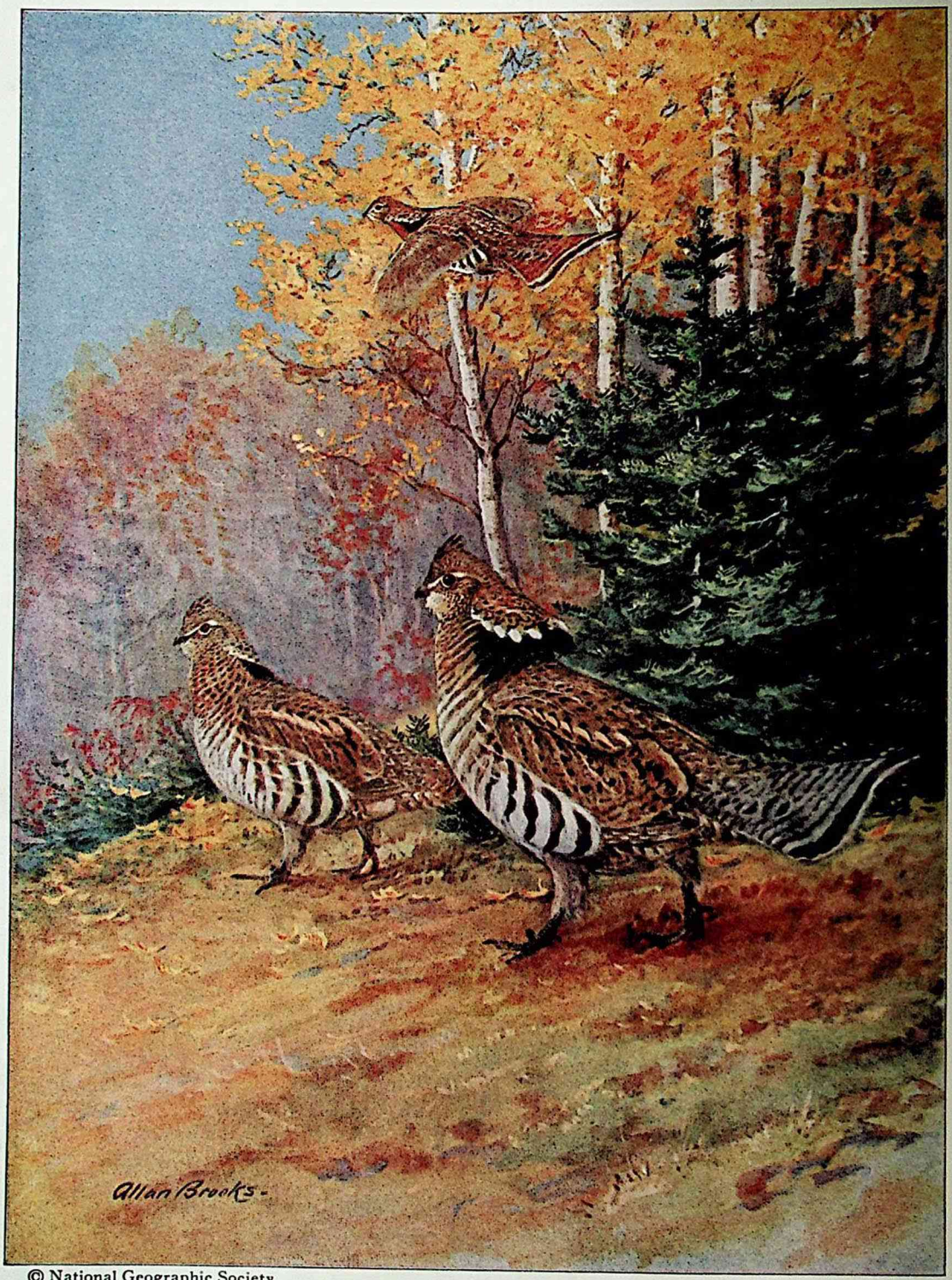
Immediately answer came in kind from farther away, and again from another side. Ruffed grouse, under the inspiration of the cool air of fall, were drumming, a thrilling sound that gave the proper accompaniment for the wild panorama before me (Plate VI).

In my mind I could see the drummer, as I had on other occasions, standing proudly on a prostrate log, with neck ruffs glistening in the sun. Suddenly he throws the body erect, with the tail at an angle, and begins the beats of his wings that produce the sound. The movement is so rapid as to defy the eye, until at the close the swiftly moving pinions show as a hazy blur about his body. The sound, a resonant drumming whose tones may carry far, is produced by the beat of the stiff wing feathers against the air (page 464).

The ruffed grouse in the North is often known as "partridge," while in the southern mountains many call it "pheasant." It is an inhabitant of extensive woodlands, where it ranges in little bands that crouch and hide at any disturbance. It is a bird dear to the heart of many a sportsman, and with its quick getaway under cover is one of the most difficult to kill of any of our game birds.

Walk through its haunts and the birds lie close until you have passed, when they rise with a resounding roar of wings that startles the novice into complete forgetfulness of his gun. The grouse dodge at once behind some tree or thicket and dart away, to set their wings finally and sail rapidly to safe coverts.

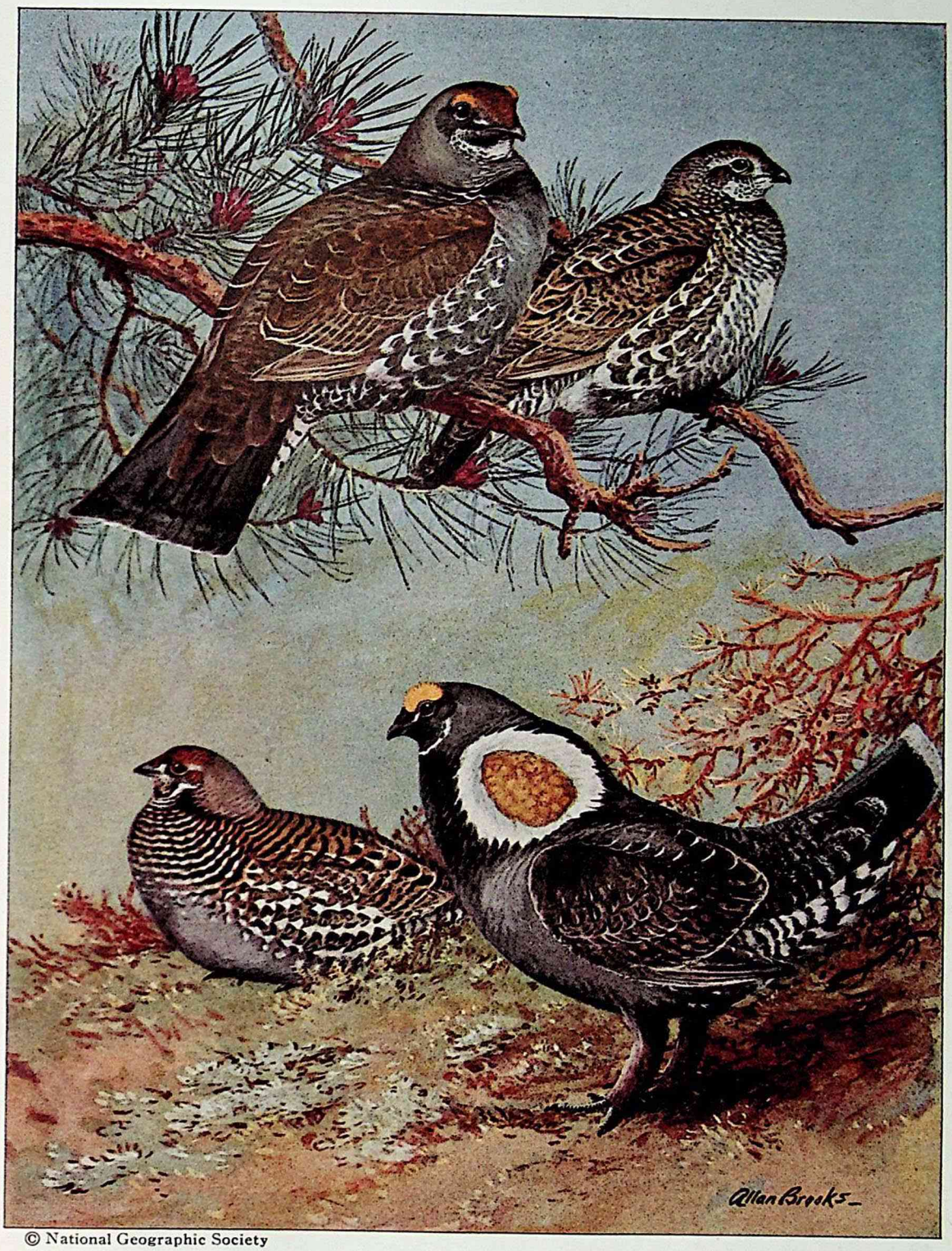
In spring drumming begins in earnest, and it is then that at times it is possible to approach and watch the drummer. Move forward cautiously when the drum is



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DEEP WOODS RESOUND WITH THUNDEROUS DRUMMING OF THE RUFFED GROUSE

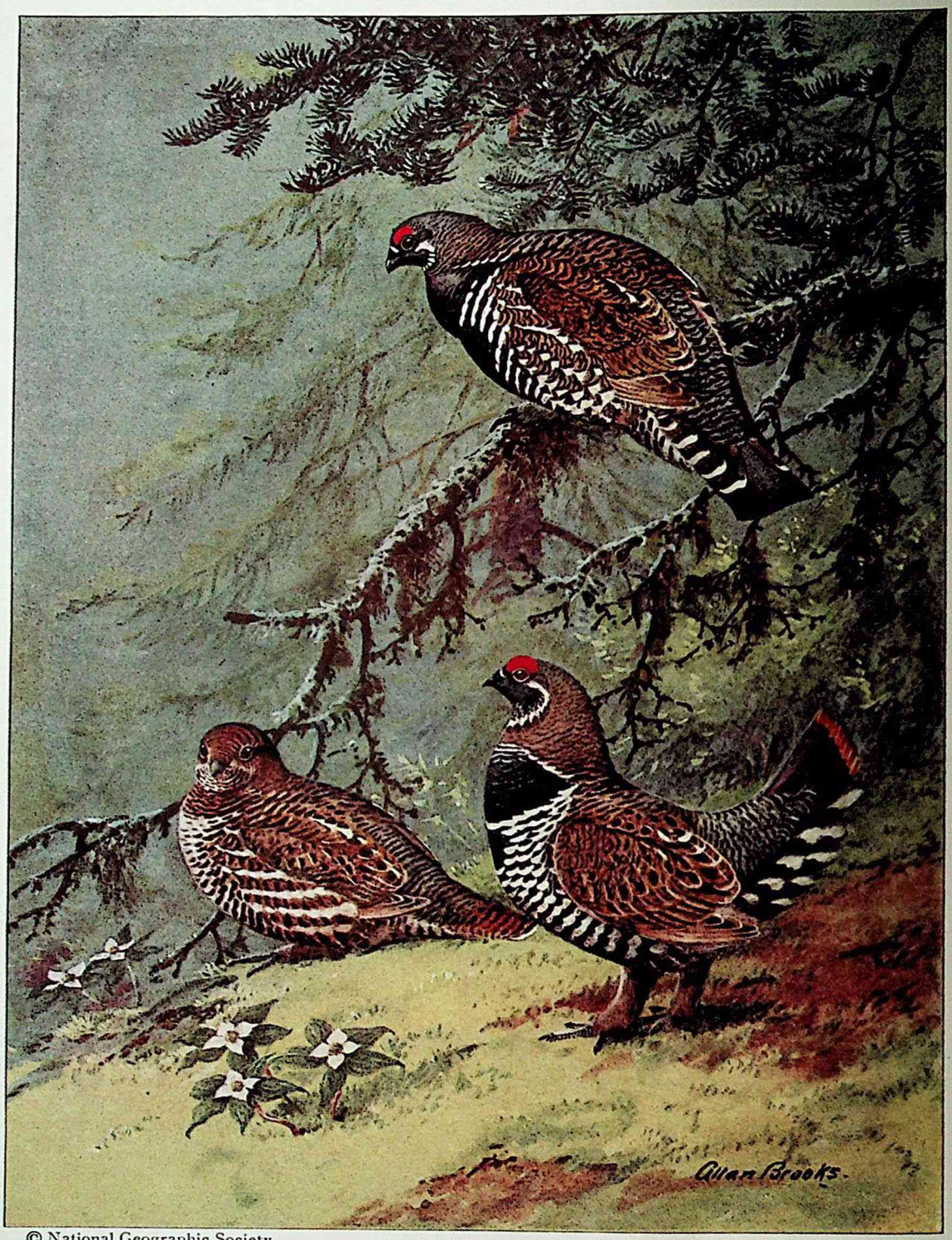
The male drums with his wings to summon his mates, to challenge other cock grouse to battle, and sometimes just to wear off excess energy. Ranging widely in Canada and the northern and eastern United States, this hardy bird thrives on nuts, grain, seeds, buds, fruit, and insects. During the unexplained "crazy season" in the fall, many RUFFED GROUSE kill themselves by flying into obstacles. As winter approaches, they grow "snowshoes," horny, comblike projections on the toes, which help support their weight in deep snow.



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TO CHARM THEIR MATES, THESE WESTERN GROUSE STRUT IN PROUD DISPLAY

By blowing out the air from inflated skin sacs which push aside their neck feathers, they produce a deep, booming sound, audible at a great distance. The RICHARDSON'S GROUSE (male and female, above) inhabits coniferous forests of the Canadian Rockies, ranging south to Montana and Wyoming, where it clings to the edges of timber and open glades along streams. Pacific coast mountains are the habitat of the foliage-eating SOOTY GROUSE (foreground pair), also known as "fool hen" because in some areas it barely moves out of the hunter's path.



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LIVING IN LONELY FORESTS, THEY HAVE NOT YET LEARNED FEAR OF MAN

Full-grown SPRUCE GROUSE (lower pair) have been caught by hand, and hunters often kill them more easily with a stick than with a gun. This naïve vegetarian frequents the vast Canadian spruce forests and tamarack swamps from the eastern base of the Rockies to the Atlantic. The equally fearless and confiding FRANKLIN'S GROUSE (above), of the mountains of Alaska, western Canada, and northwestern United States, is almost a twin of the spruce grouse, but lacks the orange bar at the tip of the tail.



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PRAIRIE CHICKENS ARE VAIN AND JEALOUS LOVERS

Struggling to preserve itself by keeping ahead of civilization, the PRAIRIE CHICKEN (female and male, below) may now be found, in greatly diminished numbers, from the southern Prairie Provinces of Canada to Colorado, Texas, and eastward to Indiana. The orange air sacs of the male, here pictured in mating display, are violently deflated to produce the resonant "boom-ah-boom" call with which he challenges all rivals. The LESSER PRAIRIE CHICKEN (above), which occupies the more southerly part of his cousin's range, is similar in plumage, but paler.

Franklin's grouse feed largely on needles of pines and firs, and in winter remain almost constantly in trees. They do not migrate, but during the colder season are difficult to find because of their arboreal habits.

Franklin's grouse ranges in the northwestern United States and southwestern Canada, from southeastern Alaska, British Columbia, and Alberta to central Idaho and northern Oregon.

Prairie Chicken
(*Tympanuchus cupido*)

The coming of spring in the haunts of the prairie chicken is signalized by a resounding booming, whose insistent repetition is certain to arouse interest. Follow the sound and eventually you will find a number of gray-brown birds resting a short distance apart on the ground in open field or prairie (Color Plate IX).

Suddenly one begins a curious dance in which the rapidly moving feet make a little pattering sound on the ground. It then droops the wings, erects the tail, and throws the pointed feathers on the sides of the neck forward like little horns, while the body swells, and two yellow sacs like oranges are inflated on either side of the neck. The bird runs forward a few steps and then expels the air from the sacs to make a hollow, booming sound.

Immediately the challenge is answered by another male a short distance away, and the two approach with threatening mien to rush at one another. The combat is no sham battle, as feathers fall and the birds strike viciously with bills and feet. Females near-by look on with seeming indifference.

The booming of the prairie chicken may begin in March, but reaches its climax in May, which is the height of the mating season. Like the ruff of Europe, the birds visit the same areas each year for their mating, even though the ground has been plowed and the original sod replaced by growing crops. Their booming is one of the sounds of the prairie countries that, heard once, are never forgotten.

Nesting duties fall entirely to the female, as the male is too engrossed in his displays to have interest in such affairs. The nest is placed on the ground, where it is hidden by dense vegetation. Rarely is it located in the shelter of groves of trees. The eggs vary from 7 to 17 in number. They are olive buff in color, spotted with brown in varying degree, some being almost without markings. Incubation requires approximately 24 days.

In the northern part of their range these birds migrate southward at the approach of cold weather, traveling north again in spring. During these movements they sometimes fly at a considerable height above the ground.

When colonists came first to the area between Massachusetts and New Jersey, they found a bird called the "heath hen" that ranged in large flocks in open country. This eastern race of the prairie chicken, marked by wider dark bars and slightly darker color in general, was hunted to such a degree, and was so molested by increasing settlement, that finally all disappeared except a small colony on the island of Martha's Vineyard off the coast of Massachusetts. In spite of careful protection this group steadily dwindled in number, until the last survivor disappeared in the fall of 1931.

The true prairie chicken (*Tympanuchus cupido americanus*) ranges from Alberta and Manitoba to eastern Colorado, Arkansas, and Indiana. Attwater's prairie chicken (*Tympanuchus c. attwateri*), smaller and darker, is found in the coast region of Texas and southwestern Louisiana.

Lesser Prairie Chicken
(*Tympanuchus pallidicinctus*)

This interesting species, marked by small size and pale coloration, is a bird of the Great Plains area that formerly was found in tremendous numbers. Early travelers in this section describe flocks ranging from fifty to five hundred individuals, whose wings, as they rose in sudden flight, made a noise like thunder (Color Plate IX).

These great flocks have disappeared, and for a period of years this species seemed on the way to extinction. With more carefully planned game laws that have afforded better protection, the birds have increased in number locally, and, though absent over much of their former range, they are still found in some sections in fair abundance.

In spring the lesser prairie chickens resort in droves to their booming ground, often a low elevation grown with buffalo grass. Here they go through antics similar to those of their larger cousins. The booming sound differs decidedly in tone, and the sacs on the neck of the male are reddish instead of yellow.

The eggs are somewhat less spotted than

those of the larger prairie chicken, some being almost immaculate.

The lesser prairie chicken ranges from southeastern Colorado and Kansas to central Texas and southeastern New Mexico.

Sharp-tailed Grouse

(*Pedioecetes phasianellus*)

In quest of food the sharp-tailed grouse may come out into the open fields of corn and wheat where its cousin the prairie chicken is at home, but it regularly ranges in and near the thickets of brush and the groves of trees that are scattered through the prairie countries (Color Plate X).

In spring the sharp-tail resorts to certain knolls where for some weeks it is occupied in the spirited dancing and fighting that accompany the mating period.

The nest is a hollow on the ground, lined with whatever vegetation is at hand. The eggs usually number from 10 to 15, and are olive buff speckled with small spots of brown. Some are almost entirely unmarked.

In the hunting season these grouse are favorite game, as they usually lie well to dogs, and to one with steady nerves, not disturbed by their roaring wings on their sudden rise, they offer excellent shooting.

At the approach of winter sharp-tailed grouse often move to regions with more timber, and at this time come into areas where they do not occur in the nesting season. Though in summer they live on the ground, in winter they spend much time in trees, where they eat dried berries and buds. At this season they often come about farmhouses and into small towns, where wheat may be found about grain elevators.

The northern sharp-tailed grouse (*Pedioecetes p. phasianellus*) ranges from central Alaska across to northern Quebec. The Columbian sharp-tail (*Pedioecetes p. columbianus*), which is grayer, is found from the interior lowlands of British Columbia to Utah and northern New Mexico. The prairie sharp-tail *(Pedioecetes p. campestris)*, of paler, buffier hue, is found from southern Alberta and Manitoba to eastern Colorado and western Wisconsin.

Sage Hen

(*Centrocercus urophasianus*)

Walk through the aromatic growths of sage in the Great Basin region, and you may be startled by the sudden flight of a huge grouse. It rises without warning and whirls quickly away to disappear in the shelter of the gray-green shrubs that extend for miles about.

This is the sage hen, better called "sage grouse," the largest of its group in America. Old males weigh from four and one half to eight pounds, and with their long tails and striking markings are truly magnificent birds (Color Plate X).

Formerly sage hens were abundant, but with extensive settlement they have been reduced in various regions, and without protection would soon become extinct. They live almost entirely in areas grown with sage, seeking other thickets only during the cold and snow of winter.

A strong, muscular gizzard, like that of the domestic chicken, is so usual among grouselike birds that it is curious to find in the sage grouse a stomach that is merely a thin-walled sack. Feeding as it does on insects and soft vegetation in summer, and on the leaves of sage in winter, the sage grouse apparently digests this food without the need of a strong grinding organ.

In spring, sage grouse gather in certain favored localities for a strange display. This begins before dawn, when it is too dark for human eyes to see. The male bird spreads its tail so that the pointed feathers stand out in a semicircle, and inflates the sacs on the breast and side of the neck so that they come nearly to the ground. These distended sacs are thrown quickly up and down, while the stiffened feathers on the neck and breast rasp against one another and against the wings to produce a rattling sound. Finally air is expelled in a curious sound difficult to describe.

Like other grouse of this group, the present species makes its nest in a scantily lined hollow on the ground. The 7 to 13 eggs (occasionally more) are olive buff spotted with brown.

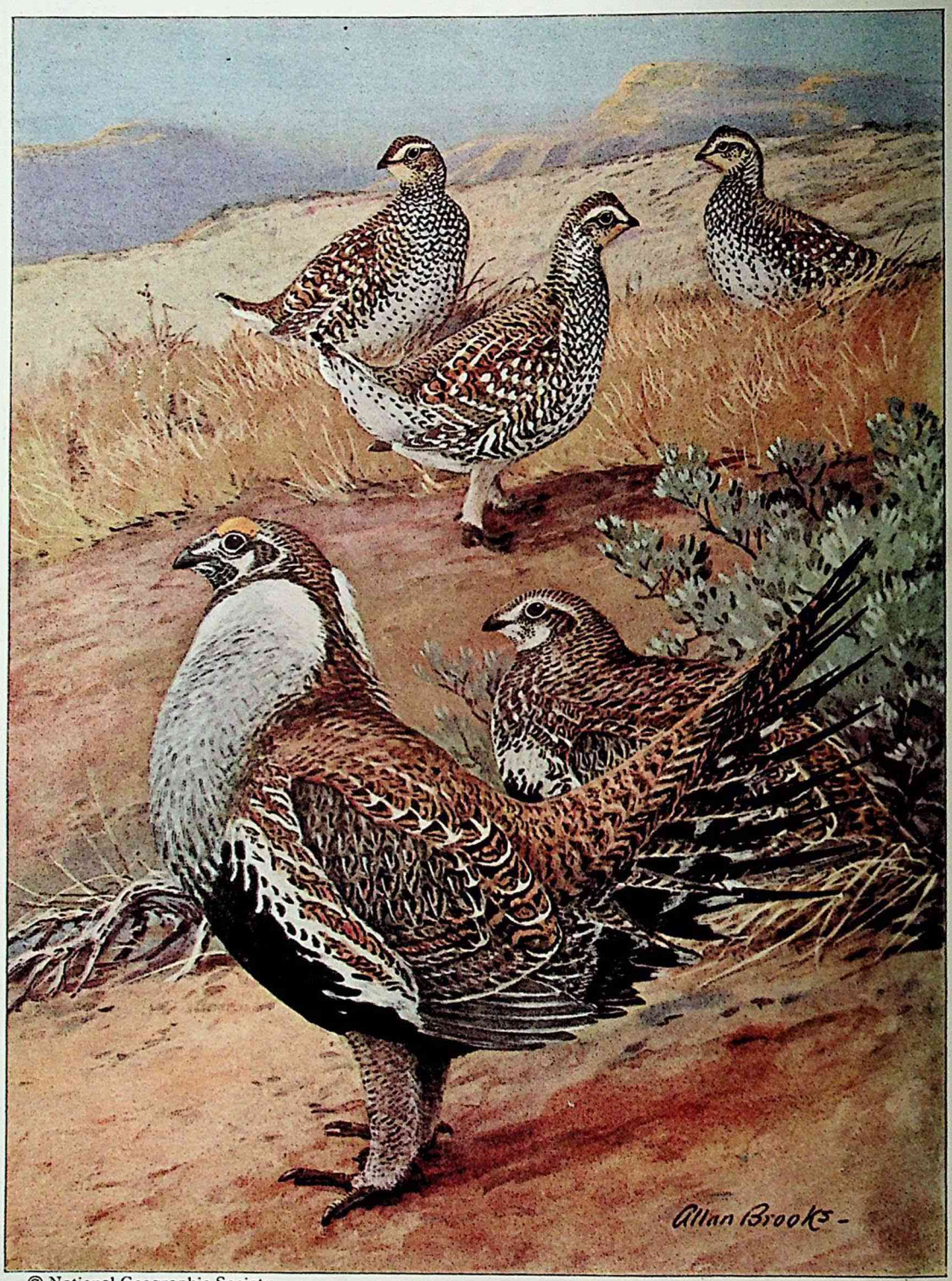
In winter the sage grouse gathers in considerable bands where food is found. In earlier days these winter flocks sometimes included thousands of birds, but that is something no longer seen.

This species ranges from British Columbia and southern Saskatchewan to California and northwestern Nebraska.

Willow Ptarmigan

(*Lagopus lagopus*)

As Elisiy and I put up our tent in the doubtful shelter of low dunes near the end



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LARGEST OF THE GROUSE, THE SAGE HEN CLINGS TO SAGEBRUSH PLAINS

Large flocks of male SAGE HENS (in foreground with female) assemble in earliest spring to croak, strut, and posture. This vainglory is punctuated with frequent vicious fights. These birds, also known as "sage grouse," are found from southwestern Canada to California and Nebraska. At the top is a female COLUMBIAN SHARP-TAILED GROUSE (left) with two males. Much grayer plumage and a more southerly range distinguish the Columbian from the northern sharp-tailed grouse.



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CHAMELEONLIKE, PTARMIGAN SUIT THEIR DRESS TO THE BACKGROUND

The two WILLOW PTARMIGAN on the ground at the left (male above, his mate below) are flecked with white to merge with a sparsely snow-strewn autumn landscape. Spring decks the males (on the wing and on the rock) in striking finery, but protects the mother bird with sober plumage. In winter they all match the snow (Plate XIII). These ptarmigan range over the arctic and subarctic regions of the North, migrating southward in winter, casually to the border of the United States. They form an important food supply for northern natives.

of the Alaska Peninsula one July evening, I heard on all sides curious cackling calls that my Aleut companion said were those of *alladēk,* or ptarmigan (Color Plate XI).

The following morning as I walked across the hummocky tundra, wet from rain, a reddish-brown bird as large as a bantam suddenly ran ahead of me with neck extended and breast brushing the ground, so that it seemed more like a crouching reptile or mammal than like a bird. This was a cock willow ptarmigan.

After moving a short distance in this fashion, the bird rose with a startling roar of stiffly feathered wings, and to the accompaniment of loud cackles dashed away a few feet above the ground.

At that instant, from the corner of my eye, I caught the movement of a brown hen bird stealing quietly away to one side, and sprang forward to surprise a little brood of newly hatched chicks that instantly disappeared in the deep moss. One that I captured nestled quietly in my hand while I admired the buff and brown markings of its tiny, down-covered body.

This was the season of hatching, and several times in the next few hours this little scene was repeated, with the parent ptarmigan attracting my attention until the young were hidden. The birds were abundant, and I was fully aware that unless they were directly in my path they simply remained motionless, hidden from my eyes by the blending of their colors with that of their tundra background.

The handsome willow ptarmigan of subarctic tundras and barrens is the outstanding land game bird through the vast region of the north, though hunted for sport in only a small part of its extended range. To various races of men, as well as to predatory birds and mammals, it is an important source of food.

The seasonal changes in color are most interesting. In late fall the willow ptarmigan is in clear white plumage except for a black bill, dark eye, and black tail feathers, the latter mainly concealed except in flight. The birds match perfectly their winter background of snow (Plate XIII).

In spring, as soon as snow begins to leave the ground, dark feathers appear on head and neck, so that the birds are particolored. As summer arrives, the ptarmigan become entirely dark, but almost at once white feathers begin to replace the darker plumage, so that through the fall the birds are in mixed dress. When winter snows come again, new white feathers have replaced all of the old dark body plumes.

At all seasons these birds match their background, the mixed dark and white plumage of spring and fall simulating the patches of snow that then are scattered through their haunts.

In winter, ptarmigan grow long, hairlike feathers on the feet that serve as supports in walking in soft snow. At this season the willow ptarmigan perform regular migrations to valleys and river bottoms where willows, alders, and other trees project above the snow. On the buds of these the birds feed when all other supplies of food are hidden. In their migrations the birds often move in flocks of hundreds of individuals. Many are killed by hunters and preserved frozen for later use.

In spring these ptarmigan return to their breeding grounds, where each male selects a bare spot of ground, and, with swollen red comb, begins to strut and call. Frequently he flies a few feet into the air, to utter his barking notes as he flutters down to earth. Battles in which feathers and blood may fly are frequent when the birds are numerous.

The female ptarmigan places her eggs in a hollow in the ground, covering them carefully with grass whenever she leaves them, until incubation begins, when she seldom wanders far. The male remains close by and flies viciously at gulls that attempt to steal the eggs, often striking them hard with his firm, heavy body.

From 7 to 10 eggs are the usual number, with variation from 5 to 17. They are handsomely marked with brown that is brighter when the egg is first laid and becomes darker as the coloring matter hardens.

Five races of this ptarmigan are now recognized, their combined ranges extending from the western coast of central Greenland and the eastern Aleutian Islands to Newfoundland, and in the mountains to central Alberta and British Columbia. Accidentally they occur in the northern United States from North Dakota to Massachusetts.

White-tailed Ptarmigan

(*Lagopus leucurus*)

Climb over the rough, rock-strewn slopes above timber line in favored parts of the Rocky Mountains and you may be fortu-

nate in finding a medium-sized, grayish-brown, grouselike bird. Often it shows no fear, permitting the closest approach without alarm.

This is the white-tailed ptarmigan, smallest of our three species of this group. In addition to small size, it differs from the others in having the tail feathers white instead of black. It is one of the rarer mountain birds and from difficulty of access to its haunts is known only to the hardier among naturalists (Color Plate XII).

The white-tailed ptarmigan live permanently on the higher slopes of the mountains and for much of the year are found above timber line. Only when snows cover their food supply do they descend into the timber or along the creeks where buds from bushes projecting above the snow furnish sustenance.

The nesting period comes in June, and the nest is placed in a depression on the ground. The eggs vary considerably in number, from 4 to 15 being recorded as complete settings. From 6 to 8 seem to be the usual number. They lack the rich coloration of other ptarmigan eggs, being buff more or less spotted with brown. Occasionally eggs are nearly plain, without marking.

Four closely allied races of this bird are recognized by scientists, extending on mountain ranges from central Alaska and District of Mackenzie to New Mexico.

Rock Ptarmigan

(*Lagopus rupestris*)

The rock ptarmigan is found almost entirely in open country, ranging regularly in the hills and mountains above the haunts of the willow ptarmigan in areas where the two occur together (Color Plate XII).

They are birds of strong, swift flight and when startled may travel as much as a mile before alighting. The wings move so rapidly as to make a blur about the body until sufficient momentum has been gained, when the pinions are set and the bird glides away at high speed.

In fall, in the Far North, this ptarmigan makes extensive migrations, often gathering in flocks of several hundred. These travel on foot and on the wing, sometimes crossing wide expanses of water.

In summer they feed on insects, berries, and green vegetation. In winter they frequent slopes where the wind sweeps the ground bare, to search for frozen berries and buds. Or where the snow is not deep, they dig it away with strong claws to expose their food. The Eskimos often trap them by placing nets on bare ground where the birds congregate to feed.

In the Aleutian Islands in early summer I often saw the cock birds rise thirty or forty feet in the air, to descend slowly, giving a cackling, crowing call. Their lookout posts usually overlooked the nest site. When flushed, the male frequently flew low over the female on the nest, so that I found nests on several occasions by approaching the cocks and then searching along their line of flight.

The nest is the usual depression on the ground, lined with grass, sometimes with vegetation arching overhead as a protection against the sharp eyes of marauding gulls and ravens.

The eggs number ordinarily from 6 to 9, occasionally more. They are buff in color, strongly marked with black and brown, resembling in general those of the willow ptarmigan, but are smaller. The female sits very close. On one occasion I stepped on the tail of one on the nest before I saw her in the grass.

There are eleven recognized forms of the rock ptarmigan in the vast region extending from Attu, at the western end of the Aleutian Islands, to Greenland. One is confined to mountains in Newfoundland. Closely allied races are found in northern Europe and Siberia.

White-crowned Pigeon

(*Columba leucocephala*)

Within the limits of the United States this handsome pigeon is found only in the lower Florida Keys and the adjacent mainland. Formerly it was abundant, but continued taking of its young for food and other hunting have considerably reduced its number (Color Plate XIV and p. 466).

Its loud, strongly accented cooing betrays its presence in forests where otherwise it would not be seen. I have wondered often at the ease with which such large birds concealed themselves in the leafy tree tops, where I could not see them until with loudly clapping wings they darted away in flight.

The nest is a simple collection of twigs that holds one glistening white egg. Many that I have seen were placed on parasitic plants growing on the branches and trunks of forest trees. The bases of the



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PTARMIGAN WEAR WARM "STOCKINGS" OF FEATHERS ON LEGS AND FEET

They nest on the ground, and so fully do they trust their protective coloration that they may not stir until almost trampled. The ROCK PTARMIGAN (male and female in fall plumage, above) breeds throughout arctic America and the barren lands of Alaska and Canada. The dapper WHITE-TAILED PTARMIGAN (male and female in summer dress, lower right and left, and young bird in fall plumage in the foreground) is smaller than other ptarmigan and is found in the Rocky Mountains.



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IN SPOTLESS WINTER DRESS, PTARMIGAN ARE HARD TO SEE

When snow flies ptarmigan plumage changes as completely as the face of nature. Black tail feathers tipped with white identify the single bird in the foreground and the flying pair as WILLOW PTARMIGAN (Plate XI). ROCK PTARMIGAN (center pair) may be recognized by smaller bills, or, in the adult male, by a black stripe from the bill to behind the eye. They also flirt black tail feathers. Only black bills and dark eyes interrupt the uniform snowy winter costume of the WHITE-TAILED PTARMIGAN (upper pair on the ground).

leaves of these plants form cups that collect water from the frequent rains, so that in climbing to the pigeons' nests I was continually drenched as I bent or broke the plants aside.

The white-crowned pigeon ranges from extreme southern Florida to the Bahama Islands, a considerable part of the West Indies, and on coastal islands as far as western Panama.

Band-tailed Pigeon
(*Columba fasciata*)

Through December fog, with occasional showers of rain, I walked slowly among the live oaks of a scattered grove near Stockton, California, watching eagerly for strange birds. A large pigeon, dimly seen in the haze, passed at a distance, its direct, swift flight resembling that of a hawk.

A little later one of the same kind flushed quickly from a tree top, only to be stopped by a shot as it darted away, and a moment later I held in my hand my first band-tailed pigeon (Color Plate XIV).

Its body was heavy, far more so than I had supposed, and its handsome markings seemed to me to make it one of the finest birds that I had ever seen. Its crop was filled with acorns swallowed whole to be ground to pieces in its strongly muscled stomach.

The band-tailed pigeon is important as a game bird in various parts of the West, and for this reason has had its difficulties in maintaining its numbers. Years ago great flocks came in winter to the valley lands of California when acorns were abundant, and thousands of them were killed by hunters.

With increasing population, there was danger that these birds might follow the passenger pigeon to extinction (Plate XV and page 495). Fortunately, wisely planned hunting regulations intervened and the birds were protected to a point where they are again abundant in many localities.

The nest of the band-tail is a loose structure of twigs built in a tree. Normally it contains one white egg, though rarely there are said to be two. Nests on the ground have been reported. The nesting period ranges from April to June. Ordinarily the birds breed in scattered pairs, though at times they have been known to colonize.

By the novice in ornithological matters the band-tailed pigeon is often mistaken for the extinct passenger pigeon, formerly so abundant. The band-tail is easily told by its square-ended tail, as the tail of the passenger pigeon was elongated like that of a mourning dove.

The true band-tailed pigeon (*Columba fasciata fasciata*) ranges from southern British Columbia and Montana to western Texas, Mexico, and Guatemala. It remains in winter as far north as the southwestern United States. Viosca's pigeon (*Columba f. vioscae*), which is somewhat paler, is found in lower Baja California.

Red-billed Pigeon
(*Columba flavirostris flavirostris*)

To find the red-billed pigeon it is necessary to visit the densely wooded bottomlands of the Rio Grande in southern Texas, as this is another of the interesting southern species that come barely within American borders (Color Plate XIV).

This bird is an inhabitant of trees, in which it makes the frail nest usual among pigeons to contain a single, pure-white egg. It is like the domestic pigeon in build, with heavy body, and strong wings that make a clapping sound as it rises in flight. The call is a loud cooing note.

This pigeon ranges from El Salvador and Guatemala north to the lower Rio Grande Valley in Texas. A closely allied race is found in Nicaragua and Costa Rica.

White-fronted Dove
(*Leptotila fulviventris angelica*)

Another species of southern affinity is the white-fronted dove, which ranges with the red-billed pigeon in the forests of the lower Rio Grande in Texas (Color Plate XIV).

Ordinarily this is a bird of the ground, where it walks about sedately under the dense cover of trees and shrubbery. It is also found in tall trees on occasion, often at a considerable height.

Flush it suddenly and it rises with a peculiar whistling sound, probably produced by the outermost primary feather of the wing. This is narrowed at the tip, so that it is shaped like a little curved sword.

The white-fronted dove differs from our other pigeons in the deep sounding notes of its call. Its nest, larger and bulkier than ordinary in this family, is placed in bushes or low trees. It lays two eggs which are creamy buff in color when fresh, but usually fade in a short time to dull white when preserved in collections.

The white-fronted dove is found from the lower Rio Grande Valley in Texas south through Mexico.

Passenger Pigeon

(*Ectopistes migratorius*)

The passenger pigeon, the widely known "wild pigeon" found in almost fabulous abundance at the time of the discovery of America, is now entirely extinct (Color Plate XV).

As indication of the hordes of these birds that formerly existed, Kalm wrote of a flock that he observed in flight in Pennsylvania in March, 1740, that was three to four miles in length and a mile in breadth. A more graphic description is that of Alexander Wilson, who told of great columns of the birds eight or ten miles in length, and of flocks extending across the sky, whose steady procession continued for more than an hour.

The passing of these multitudes was said to darken the sun like the sudden coming of a storm cloud, and the steady sound of their myriads of beating wings was likened to the roar of a waterfall.

These pigeons not only traveled in great flocks during migration, but also displayed the same gregarious instinct in their nesting. Bands came in spring to occupy unbroken tracts of forest, with the colony extending rapidly as more migrants arrived, until the birds filled the trees for miles.

Alexander Wilson reports a nesting colony near Shelbyville, Kentucky, that covered an area a mile wide and more than thirty miles long. S. S. Stevens described to William Brewster a nesting near Petoskey, Michigan, in 1876 or 1877 that, with an average width of three or four miles, extended 28 miles.

It was not unusual to see a hundred nests in a tree, and the heavy-bodied birds often crowded in desirable groves until large limbs were broken by their weight. The ground in their colonies was strewn always with fallen nests, eggs, and young, and was covered with the droppings of the multitudes of birds.

The extinction of this most remarkable of North American birds has been commonly attributed to some storm or other natural catastrophe, but in my opinion and that of many others it is to be charged directly to ruthless slaughter by the white man.

Gunpowder gave greater killing power than sticks or arrows and there was ready sale for pigeons in the markets. In early years during the colonization period there was no appreciable effect upon the vast hordes of birds, but, as settlement increased, constant persecution had its inevitable effect, particularly since the pigeons were pursued without cessation all through the nesting period.

Men with axes cut down nest-laden trees to obtain the heavy squabs. Others with long poles knocked the helpless nestlings to the ground. Netters operated constantly with spring nets to capture adult birds by the score.

For decoys, live birds with their eyelids sewn together were fastened on movable perches. When flying flocks appeared, the decoys were set in motion and their flapping wings called their passing companions down to destruction.

The development of railroads, with improved transportation and mail service in the 1870's, gave speedy transmittal of the news of migrating and nesting flocks and brought to a speedy conclusion the last chapters in the history of one of our most interesting birds. In 1879 Prof. H. B. Roney estimated that 5,000 men were engaged regularly in pigeon hunting as a business, while hundreds more took up the pursuit temporarily wherever flocks of the birds appeared.

One account says 990,000 dozen pigeons were shipped in three years from western Michigan to New York City. Another tells of three carloads per day, each car containing 150 barrels of pigeons, shipped from one town for forty days. The birds sold for from twenty cents a dozen upward. Roney reports shipments of one and one-half million birds from Petoskey, Michigan, between March 22 and August 12, 1878. In addition, more than 80,000 birds were shipped alive for use in trap shooting.

The last wild bird for which there is certain record was one killed in April, 1904, though there is account of one identified positively in 1907. I believe that I saw two in flight near Independence, Kansas, in April, 1905, but as the birds were at a little distance this is not entirely certain.

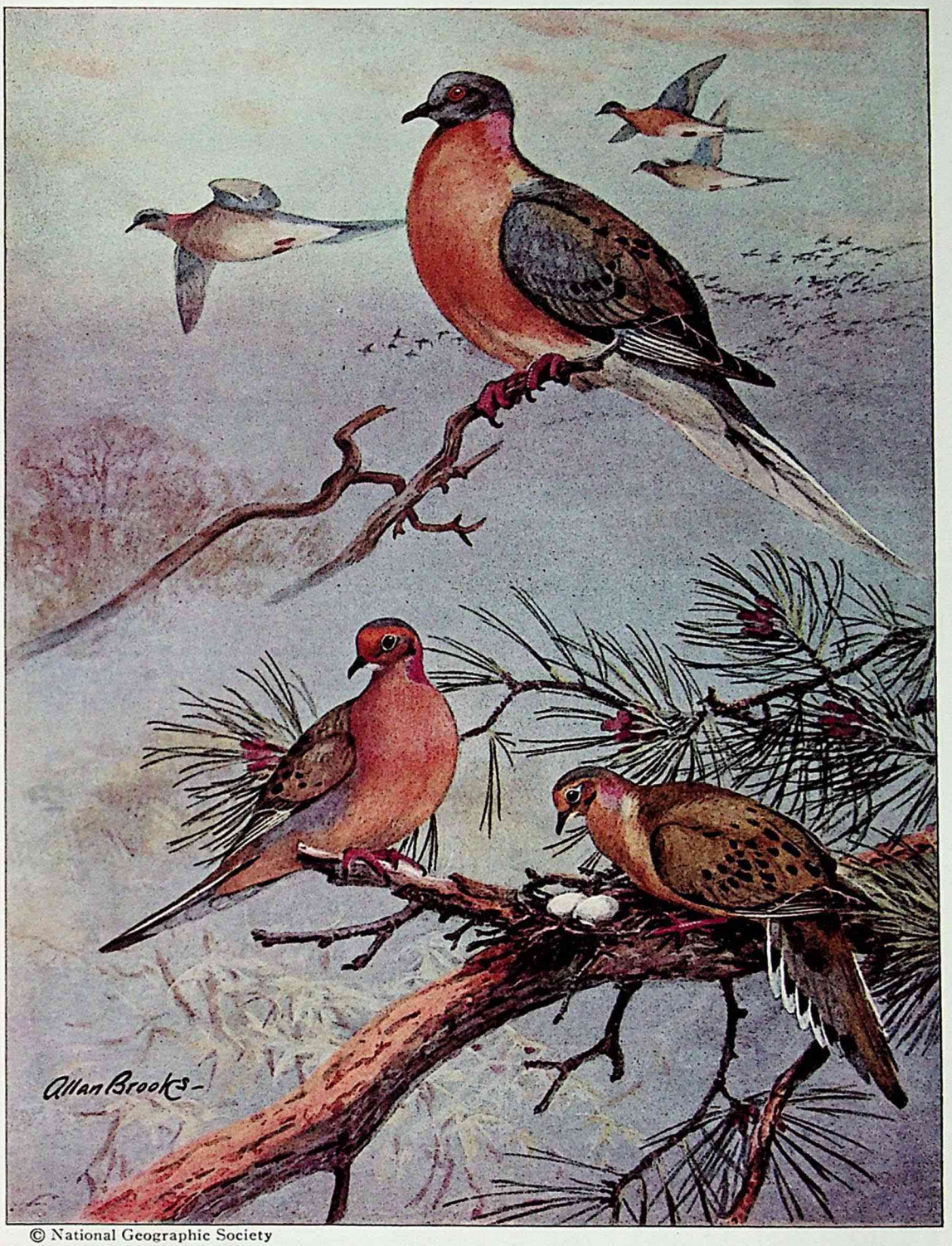
The final end of the species came when the only surviving bird of a flock long in captivity died in the zoological gardens in Cincinnati, Ohio, at 1 p. m. Central Standard Time, on September 1, 1914. This bird



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SOME PIGEONS ARE FOREST DWELLERS, WHILE OTHERS PREFER OPEN COUNTRY

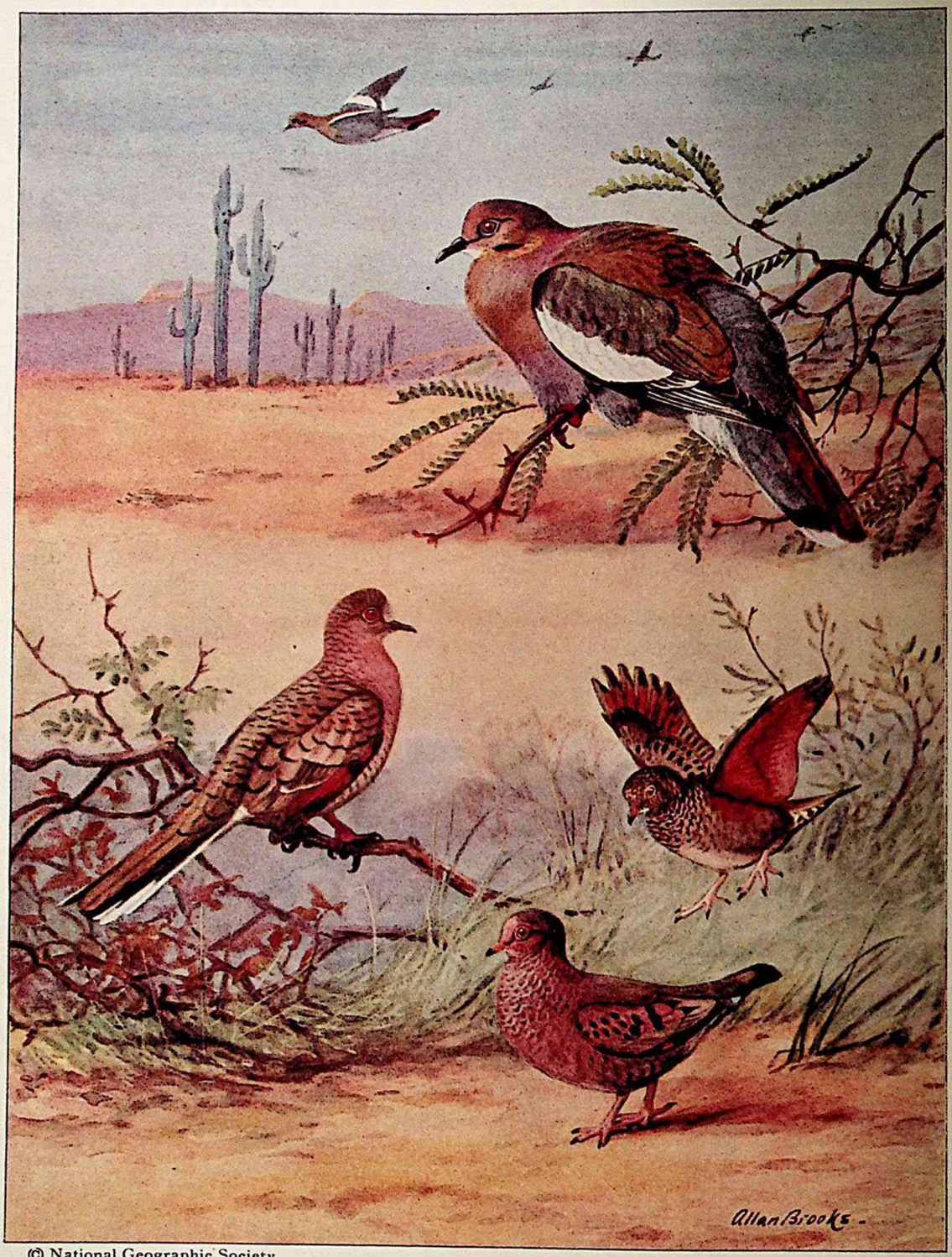
Before Federal protection of the BAND-TAILED PIGEON of the West (lower right), its flocks were easy prey for numerous hunters and the bird was threatened with the fate of the passenger pigeon (opposite plate). The shy WHITE-CROWNED PIGEON (upper left) comes north as far as southern Florida. Densely timbered areas in the lower Rio Grande Valley and Mexico are frequented by the WHITE-FRONTED DOVE (lower left and flying). The RED-BILLED PIGEON (upper right) lives along the Mexican border and southward to Central America, favoring groves of large trees close to water.



© National Geographic Society

FABULOUS FLOCKS OF PASSENGER PIGEONS ONCE DARKENED THE SKY

Long extinct, the strong-flying PASSENGER PIGEON (upper) was once one of the most abundant birds in the world and its flocks were measured by the square mile. It inhabited the whole forested area of eastern North America, fifty or more pairs commonly nesting in the same tree. Branches broke under the weight of breeding birds. They were easy to kill and indiscriminate slaughter for food wiped them out. Observers who report passenger pigeons today see either the band-tailed pigeon (opposite plate) or the MOURNING DOVE (male and female, lower). The latter is similar to its extinct cousin in form, but much smaller.



© National Geographic Society

THOUGH THEY SYMBOLIZE PEACE, SOME DOVES ARE HIGHLY QUARRELSOME

Fierce and bloody conflicts during the mating season belie their reputation for gentleness. The WHITE-WINGED DOVE (upper) is one of the best-known birds of the torrid cactus and mesquite deserts of the Southwest. Smallest of our pigeons is the dainty GROUND DOVE (male lower right and female alighting) of Florida, the Gulf coast, and the Southwest. The amorous little INCA DOVE (lower left) is equally at home along country roads and on city lawns throughout the Southwest, Mexico, and Central America. It is not easily disturbed as it searches unconcernedly for grain and weed seeds.

PARIS IN SPRING

By Maynard Owen Williams

SPRING flows across Paris in waves of joy. Tender leaves bring shade to the boulevards. Horse-chestnut candelabra lighten the masses of new green. In the Jardin des Plantes, the Luxembourg Gardens, and the Bois, hoops, skipping ropes, and all sizes and colors of balls give outlet for a new surge of energy and delight.

At Pré Catelan and Armenonville tables and chairs, reappearing after their annual hibernation, invite conviviality. Along the boulevards unscientific but heart-warming braziers, around which café patrons clustered all winter, give way to green tubs of pink hydrangeas. Overcoats are laid aside. Windows open wide in unconditional surrender to spring.

Along the Seine the workmen's clubs shine up their houseboats, and ragged laborers, stripping for a sun bath, become as well dressed as any man.

Poor devils along the quays lie for hours on the warm stone stairways, savoring the blessed novelty of being neither cold nor wet. In the industrial suburbs, mild weather lessens the misery.

"'Mid Pleasures and Palaces"

In the Tuileries Gardens, human beings suddenly outnumber the statues, and at the Palais Royal, where John Howard Payne wrote "Home, Sweet Home," little boys welcome staunch sailboats after adventurous voyages amid the waterspouts of the fountain.

The Gingerbread Fair, with its roaring lions, skin-deep beauty shows, merry-go-rounds, wheels of fortune, and photograph shops, starts its annual round under many aliases (page 502).

As the "Fair of the Throne" on the Place de la Nation, this street carnival has its biggest success, for there it is among its own, the common folk who get a thrill out of having gingerbread pigs "baptized" with the names of their proud youngsters.

Under other titles, the Gingerbread Fair later spreads its tents before the Invalides and paves the Avenue de Neuilly with pleasure from the Porte Maillot to the Seine. Along the outer boulevards it competes for custom with cinema and cabaret.

How long it can last, none of the sellers of nougat or spinners of fortune wheels can say. "People don't seem to buy live turtles any more," one veteran sighed.

There are zoos from one end of Paris to the other. Giraffes brush at the clouds with inadequate ears; a fat sea elephant tips its head back like a man gargling, in order to eat fish from the hands of a keeper standing on its back; monkeys chase fleas, lions obey a trainer, and elephants, doing elephantine tricks, collect tips in their trunks (page 520).

As for donkeys, ponies, and goats, there are squads of them, each ready to go into action any time a pair of chubby legs straddles its back or a dainty miss of four takes the reins.

Sophisticated City in Simple Mood

Paris offers its children countless simple delights. A youngster can ride a camel, drive a llama or an ostrich, lance rings from a merry-go-round, whirl to music inside a miniature plane, dig in the sand, sail a yacht, or forget the world at a puppet show (pages 506 and 507).

Then there is the Zoo of the Little Ones. Any city might have one. A dozen lambs, two dozen pigs, six donkeys, twenty kids, rabbits, ducklings, guinea pigs, and monkeys to suit the taste—this is the recipe. Paris adds a baby camel and its mother. But that is mere swank.

The magic lies in those mutually timorous contacts through which confidence and companionship are established between a child and a pet. Tiny children feed woolly lambs from bottles and squeal with delight when the little beggars suck the nipple off and spill milk down mother's black dress. There is something enormously appealing about being allowed to feed another person's livestock when you are young in Paris in the spring (pages 504 and 520).

Every afternoon, governesses and their well-dressed charges invade the generous expanses of forest, park, and square. On Thursdays, when the schools are out, and Sundays, when everyone is, Paris goes sylvan to an unbelievable degree. Lying on the grass is a major sport. Within smart race tracks at Longchamp or Auteuil, nature lovers stretch out under the sun, some scarcely raising their heads as prize-seeking hoofs pound by.



Photograph by Maynard Owen Williams

A PIG IS THE PATRON OF THE GINGERBREAD FAIR

Here on the Place de la Nation a gingerbread pig is being "baptized" by having the name of its buyer written in frosting on its shiny flank. This street carnival moves across Paris, changing its name as it goes and keeping alive the holiday spirit once fostered by the Fair of St. Germain, the Feast of Fools, and other popular festivals (page 501).

Homes of the rich overlook the Parc Monceau, but "Liberty, Equality, and Fraternity" obtain in the park itself. Working people come in from across the Boulevard de Courcelles as well as children from the aristocratic Avenues Vélasquez, Ruysdaël, and Van Dyke (page 522).

Strangest of the Parisian parks is the Buttes Chaumont, laid out by Haussmann, the boulevard builder, on the site of the old plaster-of-Paris quarries. Rising in the middle of its artificial lake is a seeming mountain, and surrounding verdure glorifies what was once a hideous hole. It is pleasant to think that Haussmann, ruthless wrecker of medieval buildings, could create as well as destroy.

Baron Haussmann did to teeming Paris what L'Enfant had done on paper for a nascent Washington, destined to be the beautiful capital city of a new republic. Haussmann thought in terms of boulevards, with the result that whole regions fell before the hammer of the auctioneer and the onslaught of the house wrecker. But, thanks to him, motorcars move. He was one of the few road builders of his day whose mind was broad enough for anything but pedestrians. His boulevards have brought new notes to a city whose very cobbles have been cemented with human blood.

Behind each beauty spot, history reveals some high crime or misdemeanor. Even Montaigne could see the warts on the face of his beloved city (page 534). But did that make the essayist's love any less real or less lasting?

A KISS IN THE BOULEVARDS

Young couples walk this ageless city arm in arm and openly steal kisses, some of which must be for Paris itself. One ceremonious kiss in the boulevards I shall never forget.

It was St. Catherine's Day, November 25, when girls who have turned twenty-five and are still unwed don pretty caps, parade the boulevards, dance circles around embarrassed strangers, and are kissed by all and sundry. To one Catherinette came a trim officer in uniform.



© AP from Pictures, Inc.

HUGE PORTRAITS OF REVOLUTIONARY FIGURES HANG NEAR THE SITE OF THE BASTILLE

With fluttering flags and cheering crowds, members of the left-wing "Popular Front," victors in the 1936 elections, mass at the base of the July Column on the French "Fourth of July." The anniversary of the fall of the hated prison on July 14, 1789, has become the Glorious Fourteenth, the French national holiday. This year the celebration started with a parade of tanks down the aristocratic Champs-Elysées and ended with wild enthusiasm in the working-class East End of Paris (pages 510, 511, and 533).



Photograph by Maynard Owen Williams

"LET ME FEED THEM" IS THE THEME SONG OF THE ZOO OF THE LITTLE ONES

Donkeys and sheep become so insistent on being fed that one corner of the zoo is fenced off for the tiniest children. There they pat rabbits and guinea pigs or feed bread and milk to lambs and kids. On holidays there are such crowds of youngsters eager to feed the pets that some of the animals can eat no more (pages 501 and 520).

His heels clicked. His body bent elegantly at the waist. His stiff hand touched his *képi* in a precise salute.

"You permit me, mademoiselle?"

She permitted.

His kiss brushed her cheek. He took one pace back, his heels clicked, his body bent, his fingers touched his képi.

"Thank you, mademoiselle."

Another autumn had brought its harvest of self-confessed spinsters, and, having done his bit, he could look forward to spring, which brings life to the parks and visitors to the Place de l'Opéra.

People think of the Opéra as having always stood there. Yet when the Germans entered Paris in 1871 Garnier's masterpiece was not finished and the Communards, who wreaked their vengeance on hundreds of buildings, spared this splendid structure, down whose grand staircase not an aristocratic evening gown or shirt front had yet passed. The three-acre opera and ballet school, library and museum is younger than many of the spectators (page 519).

In this Parisian show place, where evening dress is again compulsory in the best seats three nights a week, you are quite likely to hear Tannhäuser singing German to Elizabeth's French, a use of harmony which shows how far art outruns politics. As ballets, "Coppelia" and "Gisela" are much beloved.

NEW LIGHTING FOR LOUVRE TREASURES

From the Opéra, two famous streets lead south. The Rue de la Paix passes Cartier's jewels, Coty's perfumes, the Ritz, and the Hotel du Rhin, now empty, once leased by a Boston club for its members to use whenever they came to Paris. The Avenue de l'Opéra passes Brentano's and the Comédie Française on its way to the Louvre.

What to see at this palace turned show place? Better select one favorite artist or art treasure and work out from there:



Photograph by Maynard Owen Williams

A STATELY STREET ON THE SITE OF A MEDIEVAL MOAT

Although relatively new as Paris streets go, the Rue Royale heard the rumble of the tumbrels carrying guillotine victims to the Place de la Concorde during the Reign of Terror. At the head of the street is the Madeleine (page 512). Maxim's, known to "Merry Widow" lovers, is a bit of the gay nineties lingering on, while boulevard life follows the gasoline age to the Elysian Fields, the Champs-Elysées.

The Winged Victory; Mona Lisa's smile, and that sweeter one of Saint Anne; winged bulls from Assyria; Hammurabi's "eye for an eye" code carved in diorite 4,000 years ago and still legible; Goujon's caryatids, looking down on Diana of the Chase; the matchless Venus of Milo; Whistler's "Mother," calm amid Delacroix paintings of massacre, shipwreck, and death; Millet's "Angelus"; the homely charm of Chardin, who painted "not with colors but with sentiment"; the prettiness of Boucher and Fragonard, Watteau and Greuze, or that triumph of modern lighting over time, the frail, deathless beauty of Botticelli's Villa Lemmi frescoes, never lovelier than now.

Choose what you like, for the Louvre can satisfy all tastes except bad ones.

Venus, Diana, and Victory may be seen two evenings a week from nine to eleven. The new lighting is a revelation. With the memory of dark winter days in that inadequately transformed palace, I looked upon our American museums with native pride. We had fewer treasures but presented them better. Let us now look to our laurels.

Neither in Athens nor in London have I seen any Grecian frieze as beautifully illuminated as the Panathenaic Procession in the Louvre. Neither in Cairo nor in Thebes have Egyptian bas-reliefs and incised inscriptions been thus revealed at their full value.

The new lighting and settings, a challenge to every conservator, will doubtless allow artists, long dust and dustily presented, to speak with new eloquence.

A WIDE VISTA TOWARD THE SUNSET

From the Louvre a broad band of beauty —like the Mall in Washington—stretches westward to the Seine, hurdles a few smoke-



Photograph by Maynard Owen Williams

A CHANGE IN STYLES HITS THE PETIT GUIGNOL

Contrary to popular opinion, the Parisian puppet show is not confined to Punch and Judy. There are scores of parts and dozens of plots, many of them as familiar as fairy tales to young visitors to the Tuileries Gardens. Père Guignol here shows a harridan of the old school a new type of wooden-headed actress for the puppet stage, thus arousing female jealousy among the nitwits.

stacks, and continues to St. Germain, St. Cloud, and Versailles, twelve miles away.

Standing in the Place du Carrousel and looking up that incomparable vista past the obelisk in the taxi-infested Place de la Concorde, one can almost forgive the destructive mania of the Communards, for it was they who, by burning the Tuileries Palace, opened this view toward the sunsets.

The Tuileries Gardens seem to have been laid out with square and compass (page 513). As if fresh from a beauty shop, Paris here challenges "Am I not fair?"

Yes, more than fair, for this combination of promenade and garden, forest and art gallery, playground and yacht pond, woos with friendliness as well as artifice.

Children adore that honest artisan and artist Père Guignol, who carves and paints his puppets, including Punch and Judy, and then gives them voice and action in his little theater among the trees.

Lovers sit beside nurses who tend to their knitting. Students read, artists paint, and even self-satisfied bureaucrats from nearby offices become human. Down the pearly distances at dusk a thousand motorcars sparkle like diamonds on the Champs-Elysées, which mounts toward the flickering flame loyal men renew each night above the tomb of the Unknown Warrior (page 518).

MUSEUMS BY THE SCORE EPITOMIZE PARIS HISTORY

Paris, with its scores of museums, is itself more wonderful than any of them. But how understand Paris without visiting the collections in which its history is epitomized?

At the Carnavalet Museum, pictured in 16th-century tapestry, one sees the shops which formerly lined the Bridge of the Money Changers, or the Place Vendôme, usually so empty, as it looked when filled with the Army of the Orient, in 1855. Here is the First Republic's Magna Carta, the tables of the Rights of Man; here a key of the Bastille and the rooms where Madame de Sévigné lived and wrote.

Throughout my visit to Paris the billboards were covered with posters for the National Lottery. "Try your luck," urged the Government. The Carnavalet, keyed



Photograph by Maynard Owen Williams

OPEN-MOUTHED DELIGHT WELCOMES A PUPPET SHOW

Late in the afternoon and inside the theater, the camera caught this unstudied picture of audience response to a puppet performance directed by Père Guignol. Only a few puppeteers continue the craft, but children retain as keen an interest in the knock-about drama of the Petit Guignol in the Tuileries Gardens as do their elders in the farce-and-horror fare of the Grand Guignol in the Rue Chaptal.

to the present as well as the past, offered a most interesting exhibit tracing back to 1539 what Balzac called "The Lottery, the most seductive elf in the world." In turn it has been a grab bag, raffle, wheel of fortune, and charitable institution. Abolished just a hundred years ago, it is again a principal figure in the Paris scene.

Oriental art is caviar to many, but the Guimet and Cernuschi Museums bring to Paris such wonders of the East as Marco Polo knew; Greco-Buddhist stuccoes and calm-faced Buddhas with an air of peace.

As you head up the Boulevard St. Michel —the "Boul' Mich'" to thousands of American artists—you see through the railing the remains of Roman baths beside the Cluny Museum. Once among its medieval woodcarvings, ivories, armor, faience, and enamels, you may forget even a luncheon engagement.

People come here to see a curious medieval chastity belt and forget it in their wonder at a 14th-century Angel of the Annunciation. In the ruins of the Roman baths are four stone altars. Found in 1710 under the choir of Notre Dame, they date from the days when "all Gaul (was) divided into three parts" and a delegation of Parisian boatmen was received by Tiberius.

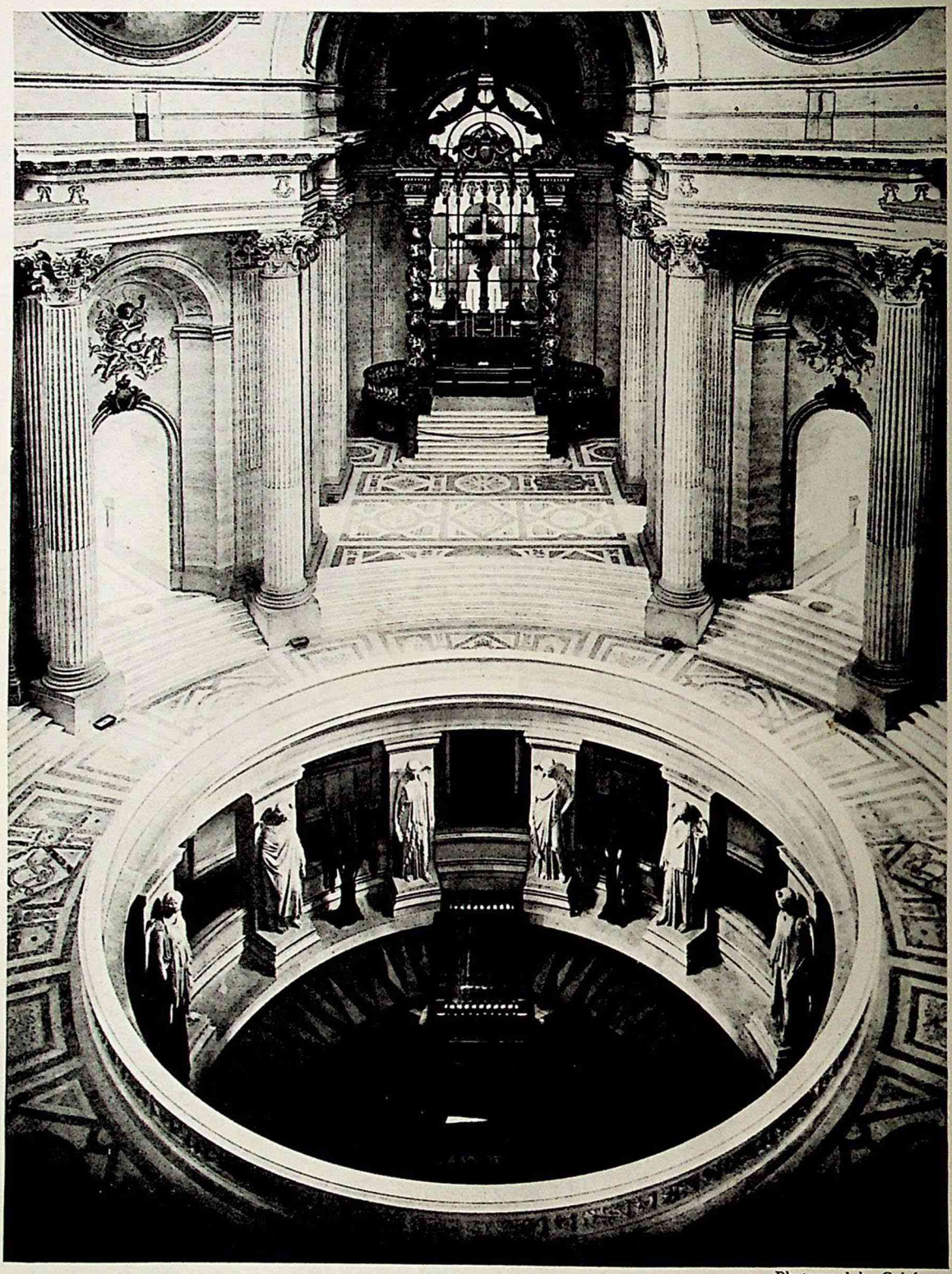
In the Luxembourg Museum the work of selected artists is displayed for ten years on its way to permanent fame. The Rodin Museum, hard by the Invalides, in the midst of a wide garden, is among the most thrilling of all.

WHERE NAPOLEON'S SPIRIT DWELLS

Something of blue and yellow light, something of majesty and mass, something of sentiment and tradition make Napoleon's tomb in the Dôme des Invalides unforgettable. The shiny, massive cover of red Finland granite, upon which the visitor looks down, is more impressive than if it towered above his head (page 508).

In the crypt are ten heroic bas-reliefs which record the versatility of Napoleon and his influence on architecture, public works, education, law, and administration.

Twice this giant escaped from exile. His first return ended at Waterloo. His second



Photograph by Crété

SURROUNDED BY STATUES SYMBOLIZING HIS VICTORIES, NAPOLEON'S ASHES LIE IN A MAJESTIC RED GRANITE TOMB

When brought from St. Helena to a second sepulture beside the Seine, the Emperor's body was placed in the crypt of the royal chapel attached to a military hospital founded by Louis the Great; hence the name of this shrine, Dôme des Invalides. Behind the statues are bas-reliefs depicting Napoleon's versatility (page 507). Marshal Foch, whose body now lies in a crypt behind the high altar in the upper center, will soon be re-interred in the Chapel of St. Ambroise, behind the arched doorway to the right.

ended under that high dome at the Invalides. Men stand in awe beside the six-fold casket of one so impatient that Josephine, while Gros was painting his portrait, had to hold him on her lap, so patient that he almost conquered Europe.

On Napoleon's Arch of Triumph—center of aristocratic Paris—the most spirited figure is François Rude's "La Marseillaise," symbolizing a song named from barefoot Provençal troops, including men of Marseille, who came to Paris to storm the Tuileries in 1792. That marching song of a rabble—who called it "music with a mustache"—became the national anthem of French patriotism.

Rouget de Lisle, author of the "Marseillaise," knew prison and despair. But his song touches glory.

Beyond the Invalides rises the Eiffel Tower, until the erection of the Chrysler and Empire State Buildings the loftiest structure on earth. Outstanding feature of the exposition of 1889, it will look down on next year's exhibition of arts, crafts, and sciences as they affect modern life (page 512).

Viewing stand, 984-foot advertising column, and wireless mast, Eiffel's 47-year-old colossus, straddling the very center of the 1937 exposition, will probably attract new crowds to its three platforms, reached by snail-paced elevators in which a ride to the 905-foot level costs about as much as a round trip to Versailles.

EASTERN PARIS FROM A PLANE

Thanks to aerial photography, the reader, in his easy chair, can study at leisure parts of Paris which it would take many arduous hours to cover on foot.

To picture the 20 *arrondissements*, or wards, of Paris would require some 250 aerial photographs like that on page 511.

Resolve that modern mosaic into its historic and human elements through the microscope of understanding and you will run the gamut of French life and letters from the days of the Romans.

In the foreground was the suburb of St. Antoine, through which the Sun King, Louis XIV, brought María Theresa, his bride, to Paris. As a protection against possible trouble from that quarter, the intimidating Bastille had been built. Its fall gave France its Independence Day and its hated stones were set in the Pont de la Concorde so that free feet could tramp upon them. In the pavement behind those two autobusses, white lines still mark the site of the Bastille walls, stormed by the frenzied Revolutionary mob on July 14, 1789.

Beneath the white lines now extends one of the most modern stations of the subway, called the "Métro." Six per cent of its riders are uncrowded first-class passengers and the rest are close-packed masses to whom the difference between a four-cent fare and a seven-cent one means more than comfort. Fifteen years ago, 14 per cent traveled first class.

SUBWAY STATIONS BECOME REFUGES FROM POISON GAS

The relatively compact subway system of Paris leads the world in the number of passengers for each mile of track. But defense from gas attacks as well as transportation now figures in the subway program.

In the heart of the thickly populated regions of northeast Paris, two subway stations already can be used as shelters from poison gas attack. The air can be filtered against any known form of noxious gas, and 8,000 people could be safe for hours in one of these subterranean retreats.

With one hundred such stations, costing 13 to 14 million dollars altogether, nearly a million people—one-third of the urban population—could find shelter at depths of eighty feet or more. Buildings above ground could offer no such protection.

A subway turned poison-gas shelter is ultramodern, but canal barges moving silently under a Paris street are an old story. Running toward the right edge of the picture is the Boulevard Richard Lenoir. This broad avenue, tree-shaded and lined with parks crowded with the children of working folk, is the roof of a canal, which runs under the square also and is visible at the left. Through many locks it climbs to the Bassin de la Villette, the River Ourcq, and 3,000 miles of French canals, finally reaching Antwerp and other ports.

The next boulevard above takes its name from Beaumarchais, who, after creating Figaro, Barber of Seville, in his own image, flouted the King in his palace by staging "The Marriage of Figaro" at Versailles in spite of him. According to Voltaire—himself no mean fellow—Beaumarchais "had everything."

"Jesting, seriousness, logic, gaiety, strength, pathos, and eloquence"—he had them all, and kept a fleet of forty vessels



Photograph by Maynard Owen Williams

PARISIANS SAY IT WITH BANNERS IN THIS ANNUAL PARADE, MAGNIFIED BY POPULAR FRONT VICTORY

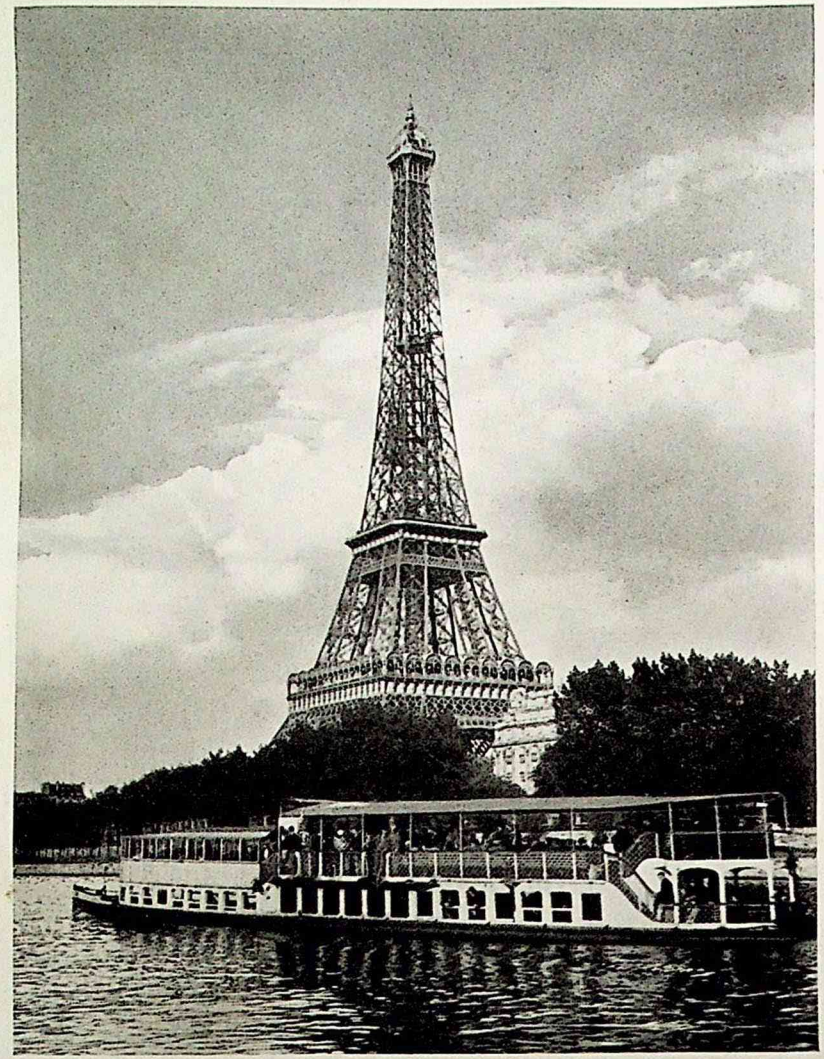
In May, 1871, a group of Communards, surrounded in a corner of the Cemetery of Père Lachaise, were shot down by General Vinoy's troops. Since 1880 an annual parade has been held in commemoration of this event. Following the victory of the left-wing Popular Front in the 1936 elections, this parade assumed tremendous proportions. Men who were ready to march before noon were still filing past the Mur des Fédérés at ten in the evening. The marchers, here forming in the Boulevard de Ménilmontant, were well behaved and in good humor. Banners identify some of them as anti-Fascists and World War veterans.



© Compagnie Aérienne Française

RISING NEAR THE SPOT WHERE THE BASTILLE STOOD, THE 154-FOOT JULY COLUMN OVERLOOKS HISTORIC EASTERN PARIS

The old fortress-prison, stormed by French Revolutionists 147 years ago last July, stood just beyond where the two autobusses are parked in the upper left-hand corner of the Place de la Bastille. Boats pass serenely beneath this busy square, for the canal at the left flows under it. Napoleon planned a huge elephant figure for the square, now dominated by the lofty column. From its summit the visitor can overlook a section which epitomizes French life and letters since Roman days (page 509).



TWO AIDS TO PLEASURE IN PARIS: EIFFEL TOWER AND BATEAU-MOUCHE

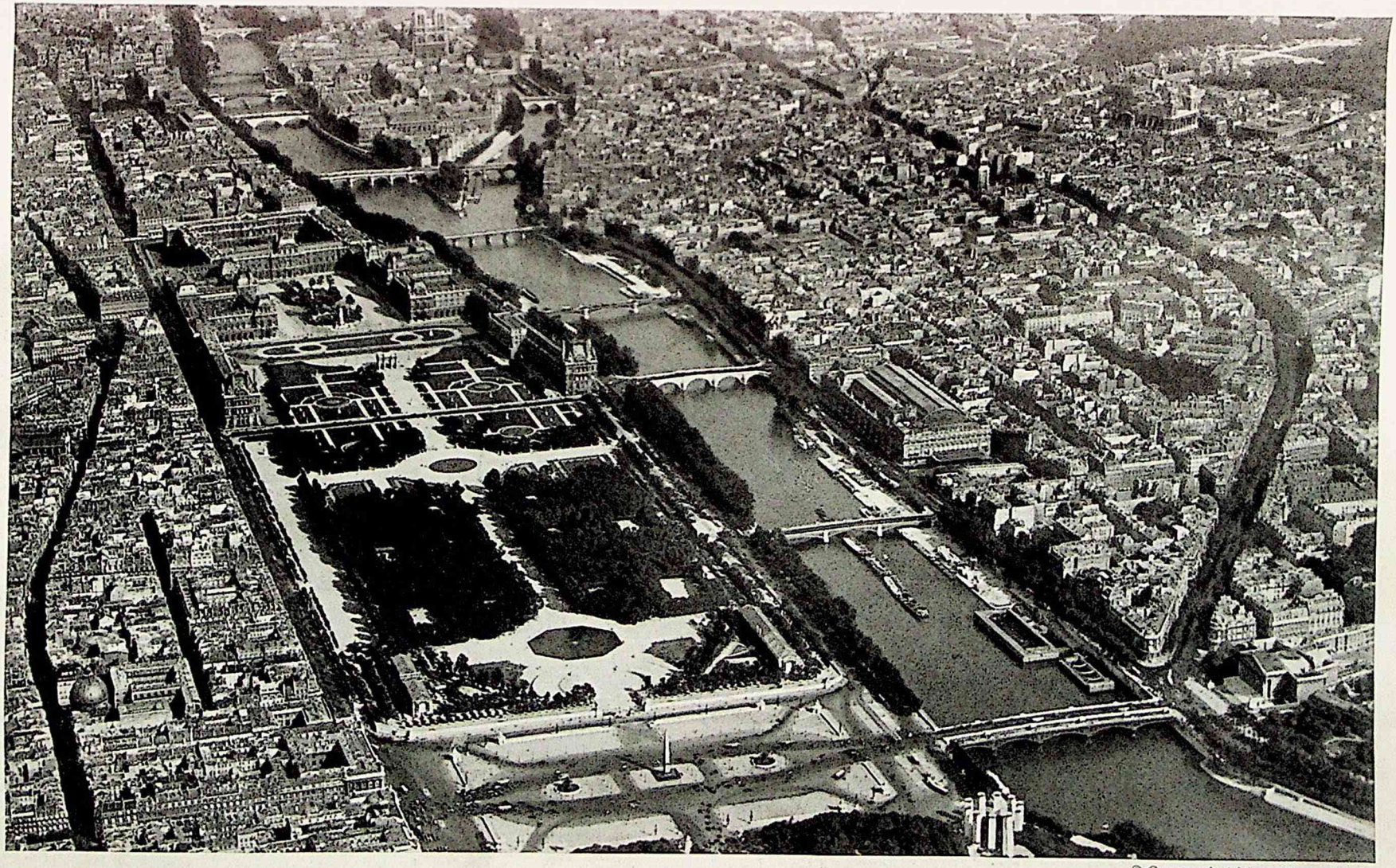
Not only do sight-seers ascend this colossal viewing stand, but time signals and radio concerts, heard the world around, are transmitted from the 47-year-old Eiffel Tower (page 509). In summer, boat trips on the Seine are highly popular.



Photographs by Maynard Owen Williams

NAPOLEON'S TEMPLE OF GLORY HAS BECOME A FASHIONABLE CHURCH

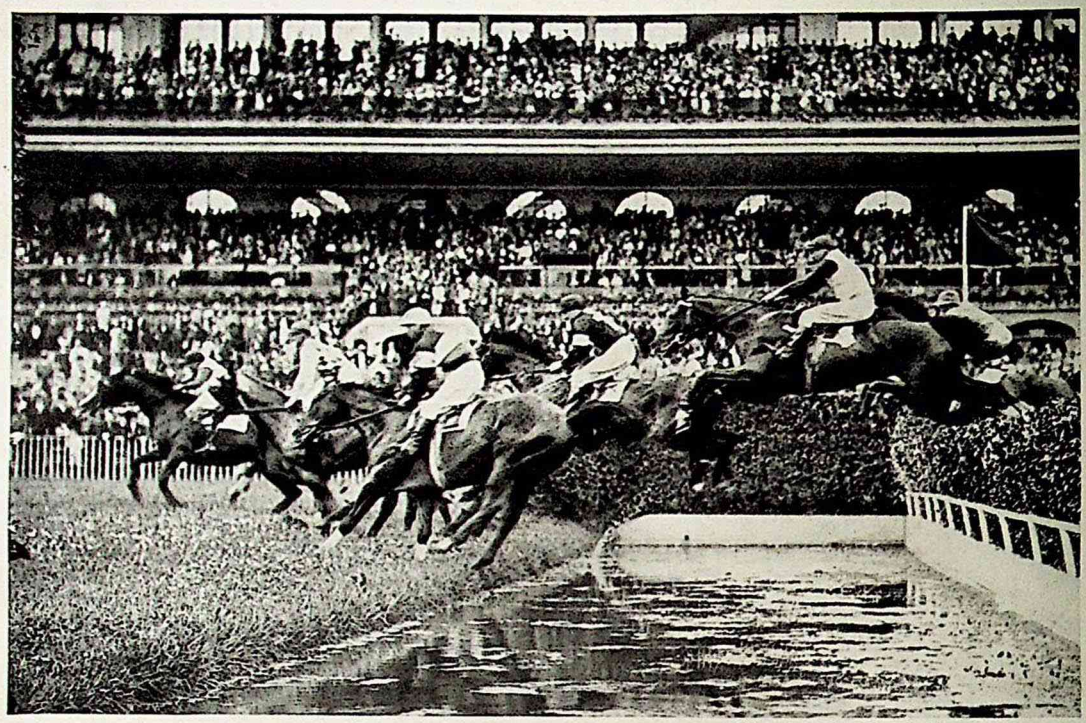
The Madeleine was begun in 1806 as a memorial to the soldiers of the Grand Army. After Waterloo turned glory to vainglory, it became the Church of St. Mary Magdalene. The massive pediment represents the Last Judgment.



© Compagnie Aérienne Française

WITH DOZENS OF BRIDGES, MODERN PARIS CUTS THE APRON STRINGS OF MOTHER SEINE

In the lower center is the Place de la Concorde, with the Rameses Obelisk (page 530). Beyond it lie the Tuileries Gardens, the Place du Carrousel, and the wide-spread wings of the Louvre. At the left of the Louvre and the Tuileries Gardens runs the ruler-straight Rue de Rivoli. Guillotine victims, on their way to what is now the Place de la Concorde from the Conciergerie Prison on the Ile de la Cité (upper left center and p. 529), made their last journey down the crooked Rue St. Honoré, near the left edge. The broad, curving street on the Left Bank (right in this upstream view) is the Boulevard St. Germain.



Photograph by Mondial from European

PUNCTUATED BY POUNDING HOOFS IS THE "BIG WEEK" OF PARIS SOCIETY

Before turning over its capital to summer visitors from the provinces and abroad, fashionable Paris has its Grande Semaine, which begins with the Grand Steeplechase and ends with the Grand Prix. Here a half-dozen racers clear a water jump at Auteuil during the Steeplechase.



© Schall from Pix

FASHIONS ON PARADE AT THE POLO CLUB

Tea tables are laid beside the playing field at the exclusive Polo de Paris, and between chukkers there is a display of gowns worn by society folk, like that between races at Ascot. Experts in fashions will recognize this as a 1935 photograph.

busy carrying arms and ammunition to the American Colonies. His statue stands down there in a nick to the right of the curving Rue St. Antoine, erstwhile Roman road built on a dike through a swamp.

Off that nick leads the Rue des Tournelles, where, in a house built by one of the Mansarts, lived Ninon de Lenclos. A medallion of Louis the Great still overlooks a staircase up which friends flocked to see Ninon; her first famous admirer, the crafty Richelieu, died in 1642, and her last, Voltaire, was not even born until 1694.

Le Brun painted her ceilings and Molière read to her his "Tartuffe." Corneille, Racine, and La Fontaine climbed those stairs below the Bourbon beak which Benoist later carved, with ruthless ugliness, in a wax relief.

Up these stairs brilliant writers brought their own provisions; down them they carried food for thoughts which still live in immortal pages.

In the upper left corner of the photograph (p. 511) is further evidence that the pen is mightier than the sword. In the 18th century an arsenal and its gardens filled that whole triangle now bounded by boulevard and canal. Sully's arsenal has become a library, the second in France.

In it is a room where Henry IV—destined to be assassinated—planned to escape the glory and boredom of a kingship shared with Marguerite de Valois and Marie de Médicis. The former, it is recorded, slept between black sheets to make her skin the whiter. The latter he later married because she was a niece of the Pope and brought him the biggest dowry of her day.

In the room are paintings of famous women from Esther, Semiramis, and Deborah to Mary Stuart and Jeanne d'Arc.

BIG BERTHA WOUNDS MARY STUART

The ill-fortune which dogged the hapless Queen of Scots has touched her picture. When "Big Bertha" spit shells on Paris, sandbags were piled against these historic portraits to save them. The sand was damp, Mary's picture suffered. Thus a 20th-century war added one more indignity to Mary Stuart.

Now for the lion of the exhibit, the Place des Vosges, in the upper right, its rectangular gardens flanked by historic arcaded houses. Once fall under the spell of Old Paris and you'll spend days invading defenseless courtyards, bribing concierges, spotting places where the iconoclastic Revolutionists carved the word "Saint" out of the street signs, and breaking your neck in attempts to find one more medieval gable or another monogram written in wrought iron along a house front. As Hugo says: "When a man understands the art of seeing, he can trace the spirit of an age and the features of a king even in the knocker on a door."

HERE HUGO LIVED AND WROTE

Rachel, the tragedienne, lived in the house at the upper end of the street which shows as a long white space, and Madame de Sévigné, exponent of belles-lettres, halfway along it. At the lower end of the line is the house of Victor Hugo.

Hugo! One should write his name in capitals. When he was too tired to write sitting down, he wrote standing up, using a stroke as heavy as that of a Chinese calligraphist. His drawings and paintings are works of art.

His brimming genius and intense industry slopped over into chapters which interrupt his novels, but help make them immortal. His description of Paris from the roof of Notre Dame is as essential here as a Bible in the Holy Land. His funeral blocked the mighty Arch of Triumph and changed the Church of Ste. Geneviève into a Hall of Fame, the Panthéon.

Spend an hour in that house and Paris will forever mean more.

Hugo's personality now dominates the Place des Vosges and the most interesting house upon it is that from which Hugo fled during political troubles, leaving on the table some manuscript pages of "Les Misérables."

Hugo's fifteenth chapter of "Notre Dame" gives a matchless picture of evolving human geography centered around the Cathedral. Let's follow his example and climb the famous tower (pages 517, 528, and 529).

This little island with its big buildings spread below us was the nucleus of the Seine-born city. The germ of urban life, sprouting here, extended wider and wider, pushing over a succession of walls. The last of them, now tossed into the moat which protected it, has given way to boulevards, parks, and apartment houses beyond the reach of our vision. Circling these is the

industrial belt, whose smokestacks cloud the Parisian atmosphere.

Not five bridges, as described by Hugo, but nine, now moor this ship-shaped island to the two banks of the Seine and another links it with its neighbor island of St. Louis.

Churches are still the most prominent landmarks, except for the Eiffel Tower, and near at hand is what Hugo called "the boldest, openest, airiest, most notched and ornamented spire that ever showed the sky through its lace-work crown." It is the spire of the Sainte Chapelle, which Saint Louis built to receive the Crown of Thorns and a bit of the Cross, purchased at a tremendous price from Baldwin II of Constantinople. This airy chapel, like a filigreed jewel-case, became their reliquary.

For the last two years a mystery play in the medieval manner has been presented against the façade of Notre Dame, now a gray, formless setting for colorful groups of players, now a snowy masterpiece reared by floodlights against the starless sky.

The 10,000 seats reached back to the pre-Roman road across the island, but lighting and amplifiers enabled all to see and hear. From the back row—the cheapest and, to me, the best—the players seemed mere puppets, the Man on the Cross an atom. Hundreds of feet above his head towered the 13th-century façade, broken by the delicate tracery of a rose window behind which powerful lights gave full value to the stained glass.

As the head of the Christ fell forward, so tiny, so helpless, so burdened with defeat, one conjured up the vision of a thousand cathedrals, of countless churches bearing the name of the Man of Galilee. There at the base of the mighty edifice the centurions and other actors were insignificant almost to invisibility. But the Spirit of Calvary, represented by the radiant church, outshone the stars.

Though introduced by medieval horseplay and clowning, "Le vray Mistère de la Passion" touched a climax worthy of Oberammergau. And poor folk, hiding their misery under the Pont St. Michel, saw reflected in dark waters the massive, shining towers of Notre Dame.

PARIS TRIUMPHS OVER MOTHER SEINE

Paris is rapidly escaping the limitations put upon its pulsing life by Mother Seine. Bridges are being so widened that a high-speed motor world can ignore the river between whose watery lanes early Paris developed on its island site.

Parisians took to motors as skillfully as their ancestors did to boats. The big square taxicabs are giving way to streamlined cars into which one folds oneself, and the stiff-backed, mustachioed charioteer of post-war days has given way to a chauffeur with a slouch. But traffic, little hampered by regulations, does tricks which scare visitors into admiration, and the chief sign of Parisian authority—even during times of political upheaval—is the white baton of a traffic officer.

Paris motors have turned the Place de la Concorde into a bull ring. The visitor who wants to study the obelisk of Rameses II, erected here just a century ago, must have the courage of a matador. Few are ever hit, but pedestrians fear that they, too, may make history in this historic square (page 530).

TRAGEDY IN THE PLACE OF CONCORD

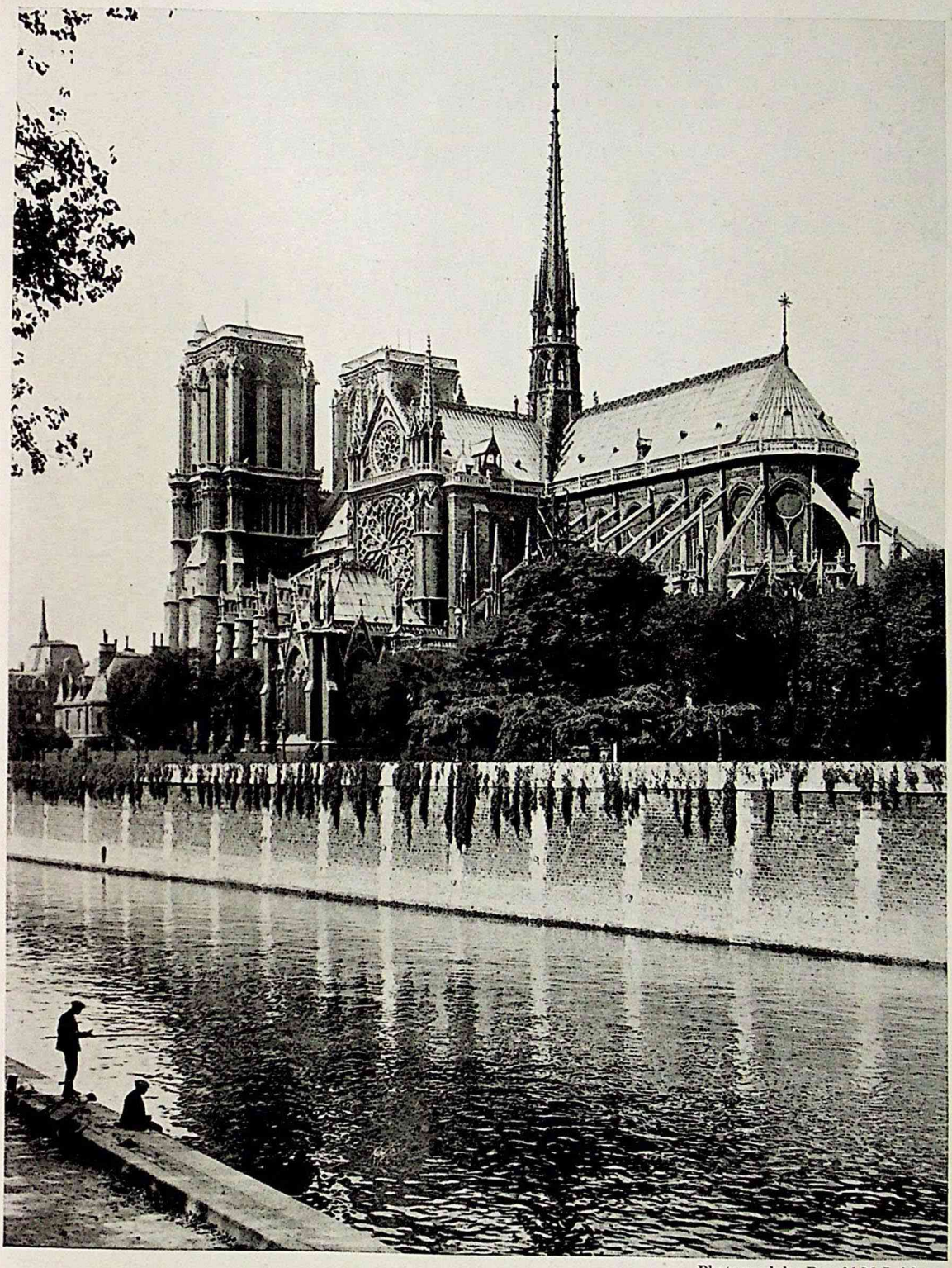
During the celebrations of Marie Antoinette's marriage, when the Place de la Concorde lay outside the walled city, an explosion of fireworks drove spectators into the Seine and hundreds were either drowned or trampled to death. Then came the guillotine, designed to provide a humane death for sheep but lent to inhuman ends when 2,800 human beings—among them Louis XVI and Marie Antoinette—perished in the "Place of Concord."

From the Place de la Concorde, twice a month, parties of visitors invade a short section of the Paris sewers, a thousand-mile underworld dramatized by Hugo.

Telegraph and telephone cables and compressed air ducts run through these tunnels, and through pneumatic tubes special delivery letters travel at astonishing speed.

In point of tonnage, Paris today is the largest port in France, but a more modest champion would be hard to find. Sand, building stone, grain, and general cargoes are handled so inconspicuously that people browsing among the bookstalls along the Seine are not even disturbed by this activity, accentuated by relief projects and preparation for the 1937 exposition.

When the strikes, amid which we lived for weeks, hit the quays, stevedores became comedians and collection boxes on long poles swung past good-humored faces lining the bridges. Even the life-guards had their



Photograph by Donald McLeish

NOTRE DAME'S ARCHITECT WAS TIME; ITS BUILDER, FRANCE

Erected on the site of a first-century temple of Jupiter and a fourth-century church, the present structure, begun in 1163, assumed its present form 600 years ago. Hugo graphically describes it as "an edifice of the transition." "The Saxon architect was just finishing off the first pillars of the nave when the pointed arch, arriving from the Crusade, came and seated itself as a conqueror upon the broad Roman capitals which had been designed to support only circular arches." The archbishop's palace, demolished in 1831, formerly hid much of the Cathedral as seen from this point on the left bank of the Seine's south branch.



Photograph by Richard A. Hansen

AN UNKNOWN WARRIOR HAS INHERITED NAPOLEON'S CENTURY-OLD ARCH OF TRIUMPH

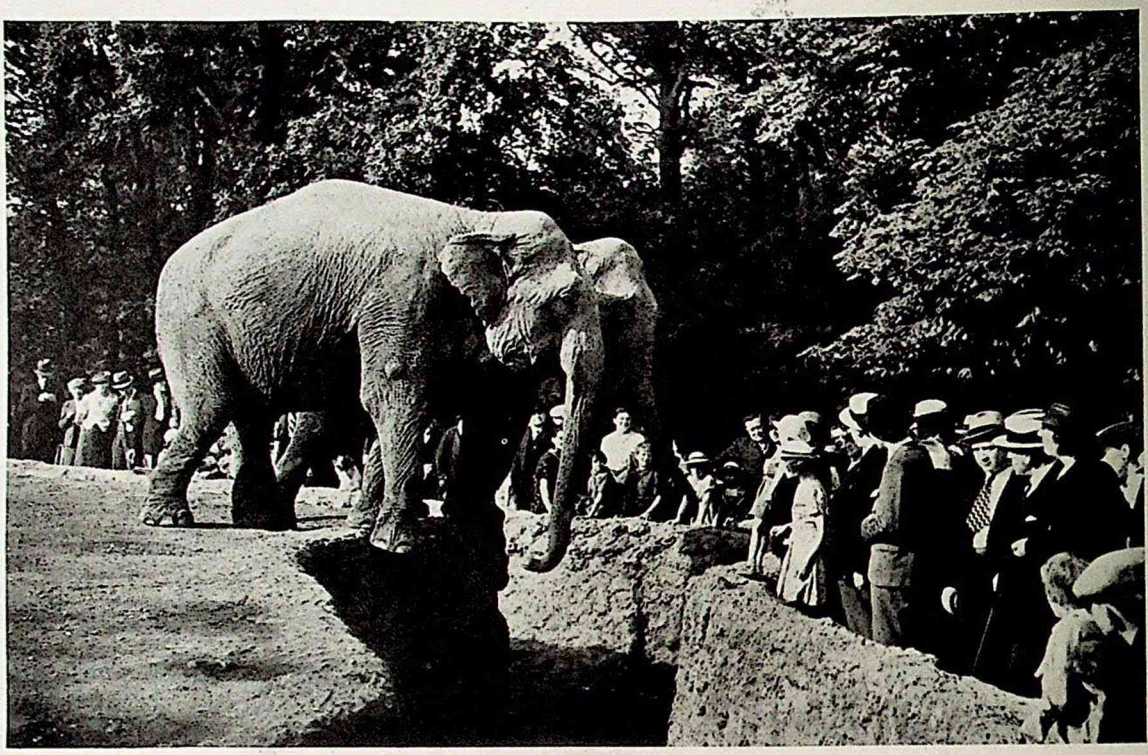
Begun by Napoleon in memory of victories less famous than Waterloo's defeat, this towering arch was completed by Louis Philippe in 1836, four years before the Emperor's body, back from St. Helena, was saluted here on its way to the Invalides. Beneath this "immeasurable arch" an undying flame burns above the body of a nameless World War soldier of France. A simple street sign (right), bearing the words "Avenue Foch," shows where the proud Avenue du Bois de Boulogne has been renamed in honor of the Generalissimo of the Allied Armies.



Photograph by Richard A. Hansen

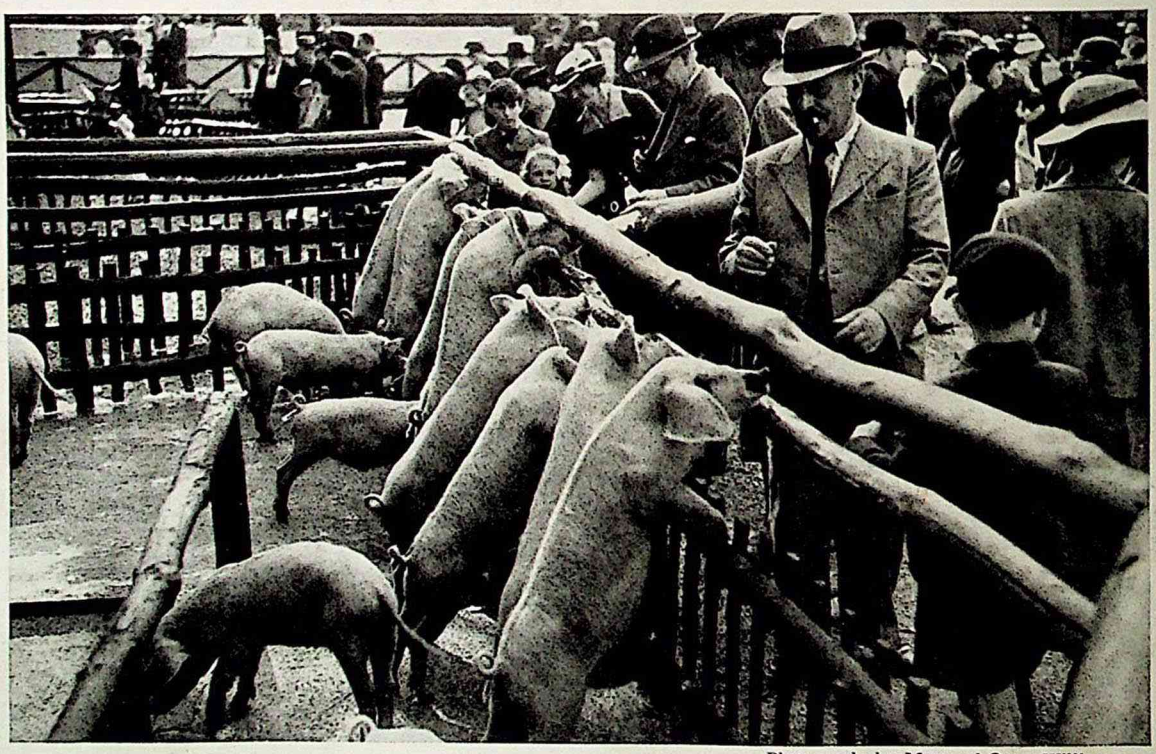
PARIS DEVOTES ITS HEART TO MUSIC

Atop the floodlighted Opéra, or National Academy of Music, figures of Harmony, Apollo lifting his lyre, and Poetry rise against the night. In spite of the growing prominence of the Champs-Elysées as a center of fashion, cafés, and cinemas, the Place de l'Opéra remains the heart of Parisian life. That portion of the Grands Boulevards known as the Boulevard des Capucines crosses the picture between the two subway ("Métro") entrances.



WITH COINS, NOT PEANUTS, PARISIANS TIP PERFORMING ELEPHANTS

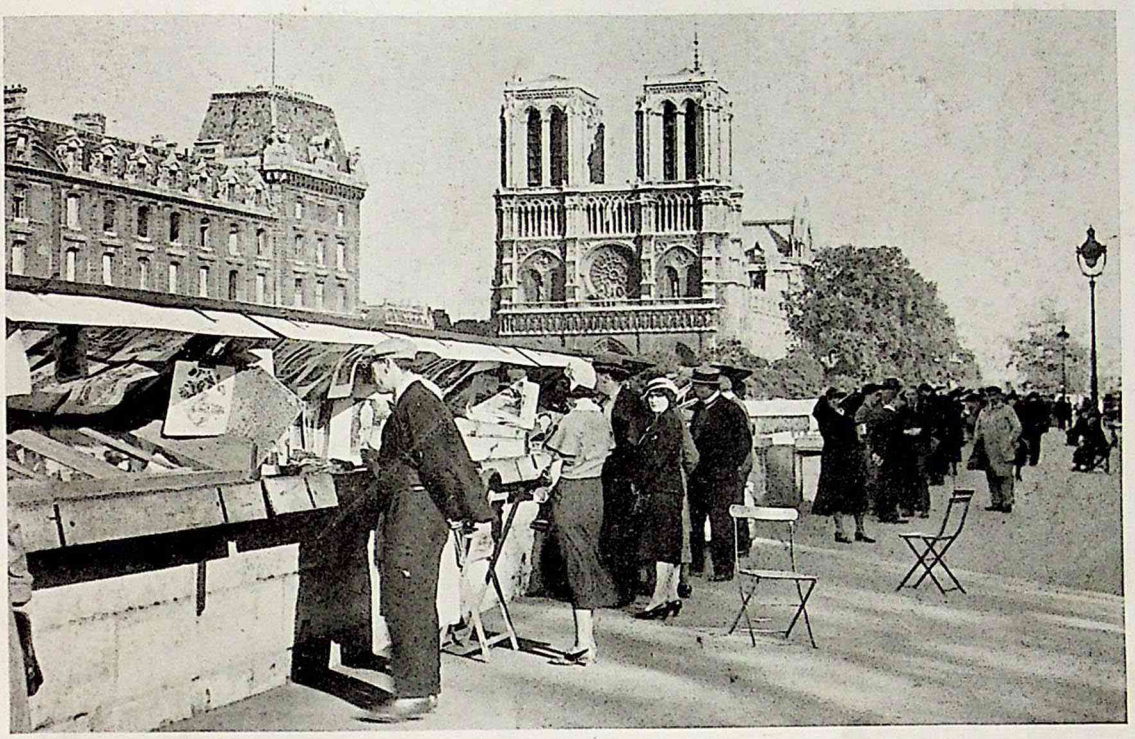
In the Jardin d'Acclimatation the elephants perform at regular intervals and collect francs for their keeper across a narrow ditch by what one American called "the Trunk Line."



Photographs by Maynard Owen Williams

THESE LITTLE PIGS FATTEN ON TWENTY-CENT MILK

Children not only pay to enter the Zoo of the Little Ones, but they help feed the stock of pigs, goats, lambs, rabbits, and guinea pigs. A pint nursing bottle of milk, costing ten cents, is the usual short cut to the heart of a pet by way of its stomach.



SCORES OF BOOK AND PRINT STALLS LINE THE SEINE

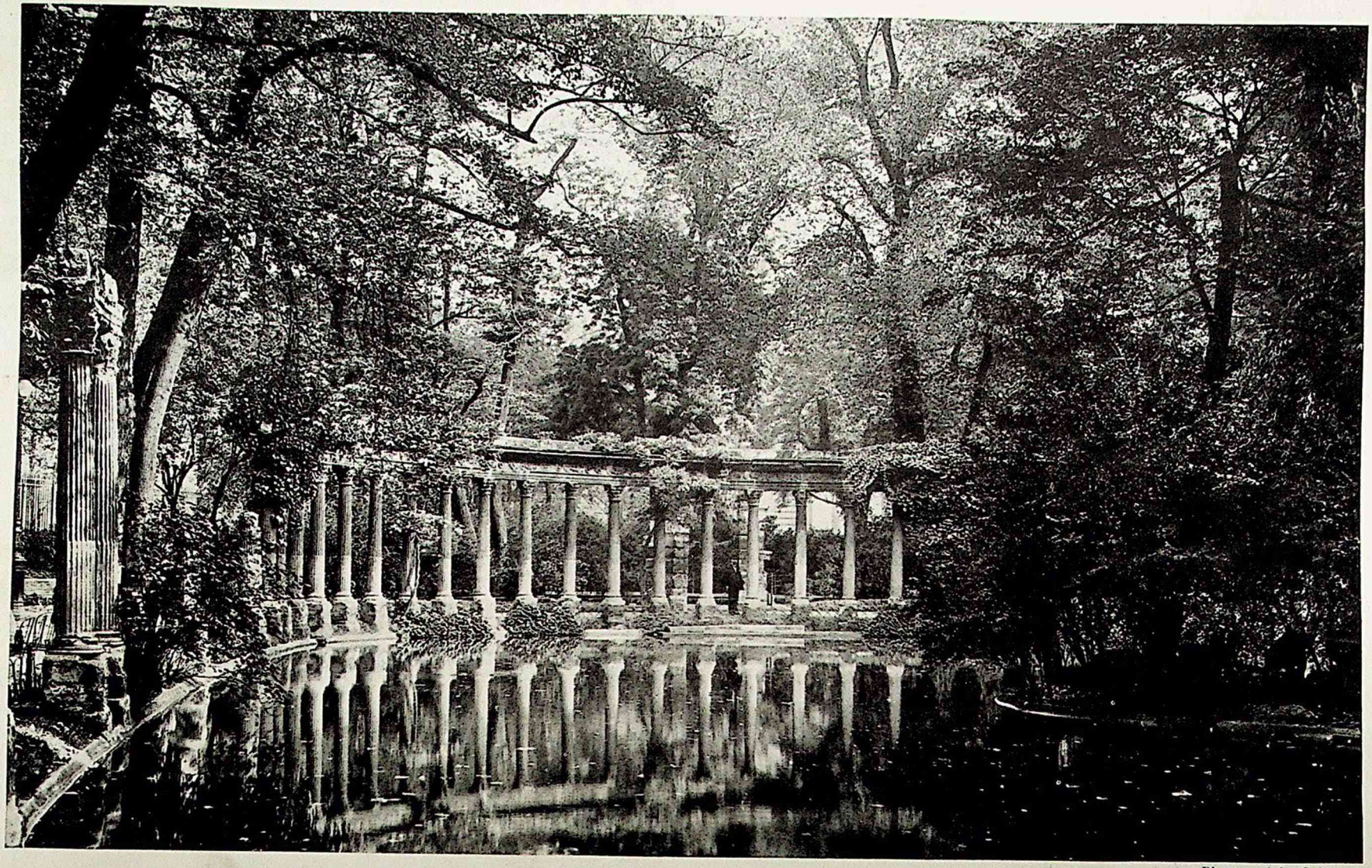
Three centuries ago the dealers in old books had their stalls on the near-by Pont Neuf. On the Ile de la Cité appear a corner of the Préfecture de Police and the Cathedral of Notre Dame (pages 517, 528, and 529).



Photographs by W. Robert Moore

BOHEMIA'S THRONE IS A CHAIR ON THE BOULEVARDS

Parnassus, home of the Muses and Bacchantes, gave its name to Montparnasse, the Left Bank center of Bohemian life in Paris. Writers, artists, and models leaven the Philistine lump of café sitters at the Dôme, where the Boulevards Montparnasse and Raspail meet.



Photograph by Crété

CORINTHIAN COLUMNS ARE REFLECTED IN A PARISIAN POOL WITH A CLASSIC NAME

In ancient times, those who did not care for farce, drama, or gladiatorial contests could watch miniature naval battles staged in a *naumachia*. This little lake, the Naumachie, in the Parc Monceau, takes its name from such classic spectacles. Its colonnade, designed for a mausoleum for Henry II and Catherine de Médicis, was brought from St. Denis, burial place of French kings. Aristocratic homes surround the park, which contains monuments to Chopin, Gounod, Maupassant, and others.



Photograph by W. Robert Moore

PHILOSOPHICAL FISHERMEN PASS THEIR LEISURE BESIDE THE PLACID SEINE

Infant Paris was cradled on an island within the protecting arms of Mother Seine. Although, with subway and bridges, the proud city now seeks to escape her apron strings, Paris loves its river. Barges laden with grain and wine, with sand and building stone, move through the town, and men with fishing poles linger beside the river's banks with scant hope of a catch, but with deep content.



© Schall from Daniel

BEAUTY AND BEAST IN THE BOIS DE BOULOGNE

The motorcar is slowly moving the center of Parisian pleasure to the west up the Elysian Fields, past the Arch of Triumph and into this oak forest, which lies between the city and the Seine. Zoo and race track, outdoor restaurant and boating basin, polo field and swimming pool, all have been added to the 2,000-acre expanse of woodland, but walking still has its devotees. Down the shady paths, like modern Dianas of the Chase, come young women who bring the breath of youth and spring to the Bois de Boulogne.

fun: "Don't try to drown yourself. We're on strike."

Crossing to the Left Bank, one enters the Latin Quarter, so called because medieval scholars used the language of the Romans whose baths, villas, and arena occupied this site.

Paris is the Mecca for students from all over the world. Near the Sorbonne or Polytechnique one can eat soup in many languages and curdled milk in many more.

ON THE LEFT BANK LEARNING THRIVES

University education, born in the cloisters of Notre Dame, soon spread to the Left Bank. Poor but proud, this republic of scholars made Paris the intellectual capital of the Middle Ages, the leavening pan of the Renaissance. The person of a student was sacred, as the Count of Savoisy learned to his cost when his residence was destroyed and he was banished because his lackeys started a brawl with the devotees of Latin and learning.

Near the Rue St. Jacques, which had known the tread of Roman legions, were the houses of the four "nations" within a nation, the four scholastic centers which made a thought center of medieval Paris.

At "Normandy" lived the Normans and Bretons; at "Picardy" the Picards and Walloons; at "England" the English, Scots, Germans, and Swedes; at "France" the French, Spanish, and Italians. These four "nations" were the harbingers of the Cité Universitaire, residential center for modern scholars.

The University of Paris, being only a teaching and examining center, lacked both campus and campus life. But the razing of the outer wall and the generosity of Emile Deutsch de la Meurthe provided the land for a "University City" resembling the quadrangles of Oxford or Chicago.

The same philanthropist, encouraged by M. André Honnorat, built the original seven buildings near which new "nations" have risen. The French provinces and Monaco, England and Canada, Denmark and Sweden, the Netherlands and Switzerland, Cuba and Spain, Armenia and Greece, Indo-China and Japan, Belgium, the Argentine, and the United States here provide homes for their sons. Provincial France, Denmark, the Netherlands, and the United States offer shelter to their daughters, too.

The heart of this University City is International House, sister of similar cosmopolitan student centers in New York, Chicago, and Berkeley. There, during one luncheon, I saw more college life than I ever did around the Sorbonne, the Polytechnique, the School of Medicine, or any of the lyceums, whose graduates, though bringing honor to their "schools," never heard of Alma Mater.

University life began in a cloister. Parisian college life today flourishes in a cafeteria. The man with a topic has become the man with a tray.

It is a far cry from the days when students slept in the doorways, to the cheap, comfortable rooms in the new University City outside the Park of Montsouris, or from narrow Latin Quarter streets, lined with Annamite, Armenian, Algerian, Greek, and Syrian restaurants, to the airy cafeteria at the Cité Universitaire.

International House helps solve a pressing problem of student leisure, hitherto spent in less desirable surroundings. In the age when "City of Light" meant "City of Gas Jets," the Bal Bullier had world-wide fame. When I last saw that dance hall, most of the patrons were Chinese students. Now it lies in ruin and a swimming pool will take its place.

In the Rue de la Huchette in the Latin Quarter great guests of the city once were lodged, and Napoleon—then unknown—once lived in the Street of the Little Fish Stall Tax.

Medievalism still shrouds these walls and painters are ever seen trying to save from oblivion such picturesqueness as has thus far escaped "improvements."

TO A MONTMARTRE MINSTREL'S MEMORY

One day, guidebook in hand, I sought out the Rue Zacharie, which erudition relates not to Zacharias but to "sac-à-lie," or "sack for lees" from wine presses which were common between the Mont Ste. Geneviève and the Seine.

Death held sordid rendezvous so frequently in this narrow lane that it had once been closed. Now it has a new sign: "Rue Xavier Privas." Standing at the entrance to this medieval alley was a woman who noticed my confusion over place names.

"Wasn't this the Rue Zacharie?"

"Yes."

"Why, after three hundred years, has its name been changed?"

"In memory of a famous *chansonnier* of Montmartre."

"Since when have Montmartre cabaret singers found honor in the Latin Quarter?"

"But he was a true artist. Verlaine himself, recognizing a great minstrel, had him repeat his songs. True, he sang in Montmartre, but all Paris listened."

"And you—did you ever hear him sing?"

"Oh, many times, m'sieu. He sang songs to me that Paris never heard. He was my dearest friend."

So much for a new street sign, around the corner from Saint Séverin, the vaulting of whose apse resembles a forest of palm trees. In this church in the Latin Quarter, students have long placed marble plaques commemorating their success in examinations. One read "Une Bachelière Reconnaissante. 26/6/25. Chiquita." A female Bachelor of Arts with a foreign name!

FRENCHWOMEN SEEK THE BALLOT

The presence of women students in the University—and they are numerous—makes one wonder when Frenchwomen will get the vote.

Pleading for political privileges already won by Turkish women and others, they meekly promise, "Even if we get the ballot, we'll still darn your socks." This in the land of those female saviors of Paris, Sainte Geneviève and Sainte Jeanne d'Arc!

Not only a woman but a photographer may get strange sidelights on "liberty." No Frenchman believes that a photographer is hampered in Paris, but it is amazing how many "authorizations" are required.

You cannot photograph the tables on the sidewalk outside a big department store without written permission. If it occurs to you to take pictures in the Gare St. Lazare or the Gare de l'Est, someone politely tells you that it is forbidden. In Les Halles I was photographing some innocent-looking and supposedly non-explosive cheeses when an attendant murmured that awful word "authorization." But go to the right man, say "Please," and you can do anything.

Thanks to Les Halles, the Central Markets, one can, with profit as well as pleasure, stay out all night. By the time the theaters are out, the whole market place is crowded with trucks piled high with crates and fragrant with odors of good things to eat. The vegetables seem to have been scrubbed, the fruits waxed and polished. In England it is the docks that thrill. But in Paris it is Les Halles. Snails and onion soup never seem to taste so good as at three in the morning within the shadow and sound of the markets.

PARIS IS CHANGING FAST

One day, in my hotel, I came upon these words of Watson White in "The Paris That is Paris": "So haste thee, gentle reader, would'st thou view the ancient courtyard of the Inn of the Compass of Gold."

I grabbed my hat, jumped into a taxi, and went at all speed to the Street of the Haughty Mountain. But I was seven years too late.

A modern apartment building stands on the site of this old-time inn, where the Normandy coaches once clattered to a halt. In it a service of refrigerator cars, also serving northwest France, has its prosaic offices.

Pushcarts line the curbs and curious folk no longer see noted beauties, followed by half the young bloods of Paris, enter Philippe's, chic restaurant which once stood next door. At the corner, a modest *bistro*, or wine shop, with its shiny segment of zinc, marks the spot where the greatest writers of Balzac's day amused themselves in "Le Rocher de Cancale."

Pouring drinks for the thirsty, mine host dismissed the brilliant days of the past with the statement that they were before his time. But he did clear up the mystery as to why May is the month when miniature brides in long veils and Eton lads with white arm bands brighten the Paris scene.

"The catechism class begins in October, and if a child is bright she has learned her catechism by May. First Communion is like graduation day."

Past the thick-walled tower which John the Fearless, like some Abdul Hamid or Governor of Sinkiang, built to protect himself from fear of assassination, I went on to the splendid house, now an employment bureau for typists and salesgirls, where Madame Du Barry lived after the death of Louis XV. I wonder if, while seeking work, they dream of that milliner's assistant who became the rival of Madame de Pompadour. Two charming women wasted on a blasé king who, knowing them, could ask, "What would life be without coffee?"

"DEVILS" FOR RENT

Near Les Halles one can rent a "devil"—a cart on which foodstuffs and other burdens are carried—for three francs a day.



Photograph by Melville Bell Grosvenor

HIGH IN MONTMARTRE STANDS THE GLEAMING WHITE CATHEDRAL OF SACRÉ CŒUR

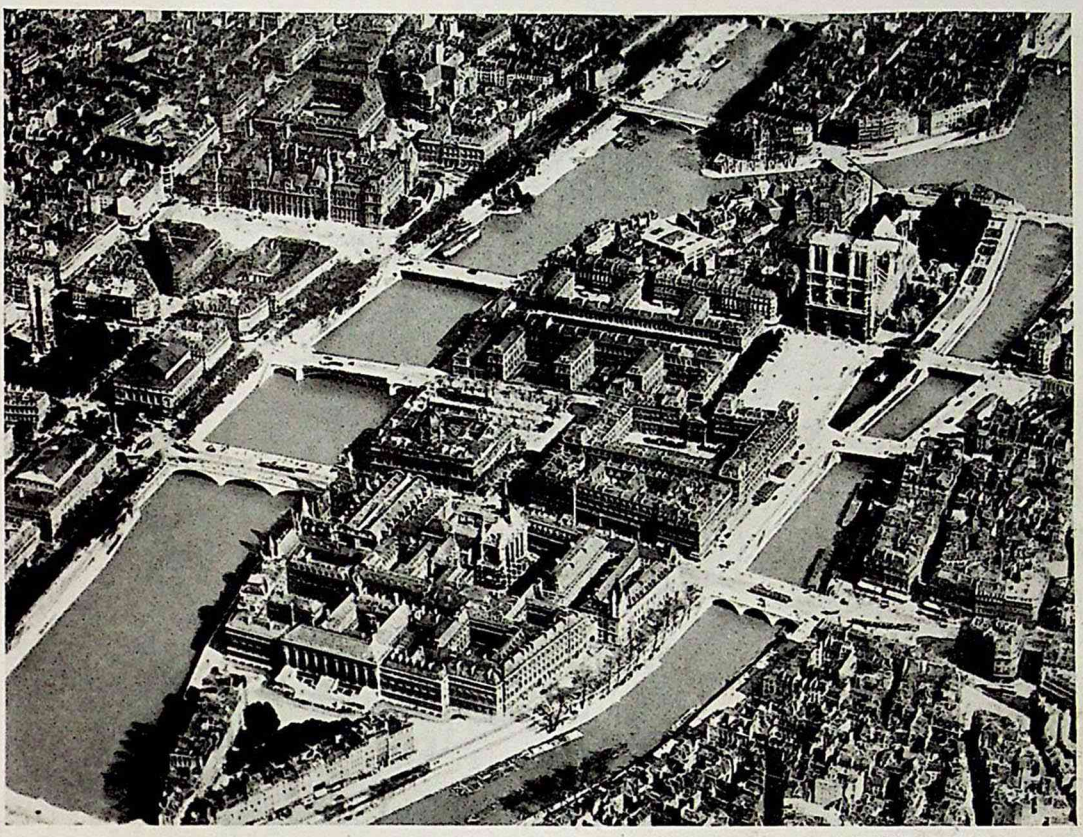
From almost any point in the city its graceful domes can be seen, fitting crown for the skyline of Paris. This Romanesque-Byzantine structure, built as a votive offering after the disastrous Franco-Prussian War of 1870-1871, rivals the Eiffel Tower as a landmark. Under dark storm clouds it takes on an unearthly beauty; on a sunny day it glistens like snow. The terrace at its foot commands a magnificent view, and along the Place St. Pierre passes an ever-interesting procession, from nuns and priests to soldiers and café singers.



© Donald McLeish

HOW PARIS MIGHT LOOK TO HUGO'S ACROBATIC "HUNCHBACK OF NOTRE DAME"

Over the parapet leans a figure as forbidding as the deformed bell ringer, Quasimodo, but it is only one of the bizarre gargoyles that gaze down from the medieval towers (page 517). Plainly seen in the distance at the left in this view from a gallery of Notre Dame are the lordly Dôme des Invalides over Napoleon's tomb (page 508), the tower of the Church of St. Germain-des-Prés, burial place of the Merovingian kings, and the Eiffel Tower (page 512). Across the curving river from the Tower, the Trocadero has since been deprived of its two tall minarets. The bridges connect the Ile de la Cité with the Left Bank (opposite page).



© Publishers Photo Service

PARIS WAS CRADLED ON AN ISLAND SHAPED LIKE A SHIP

Today the Ile de la Cité is moored to shore by bridges and freighted with important buildings. In the lower left corner is a bit of the Pont Neuf (New Bridge), oldest in Paris. In the foreground, just beyond the old houses forming the wedge-shaped prow, are the massive walls of the Palais de Justice, and partly enclosed within them is the Sainte Chapelle (page 516). In the next block are the Tribunal de Commerce and the Préfecture de Police. The building with several wings is the Hôtel-Dieu, one of Europe's oldest hospitals. Behind Notre Dame (upper right) appears the Morgue, now demolished. Bulking large on shore at the upper left is the Hôtel de Ville, the City Hall, and linked to the island by a bridge, like a barge in tow, is the Ile St. Louis, farther upstream.

You can hire a man on the spot to push your "devil" around, following or leading you, as you wish. The Empress Eugénie started the custom to help the poor. Now the devils introduced to these narrow streets by that lovely lady are often consigned to their namesake by chauffeurs in a hurry.

Beneath the modest rooms where Molière was born was a gilded horse's head, indicating horse meat was sold there. Where good beef costs 50 cents a pound, equally choice horse meat sells for 80. In this age of motorcars, horse meat is a cherished luxury.

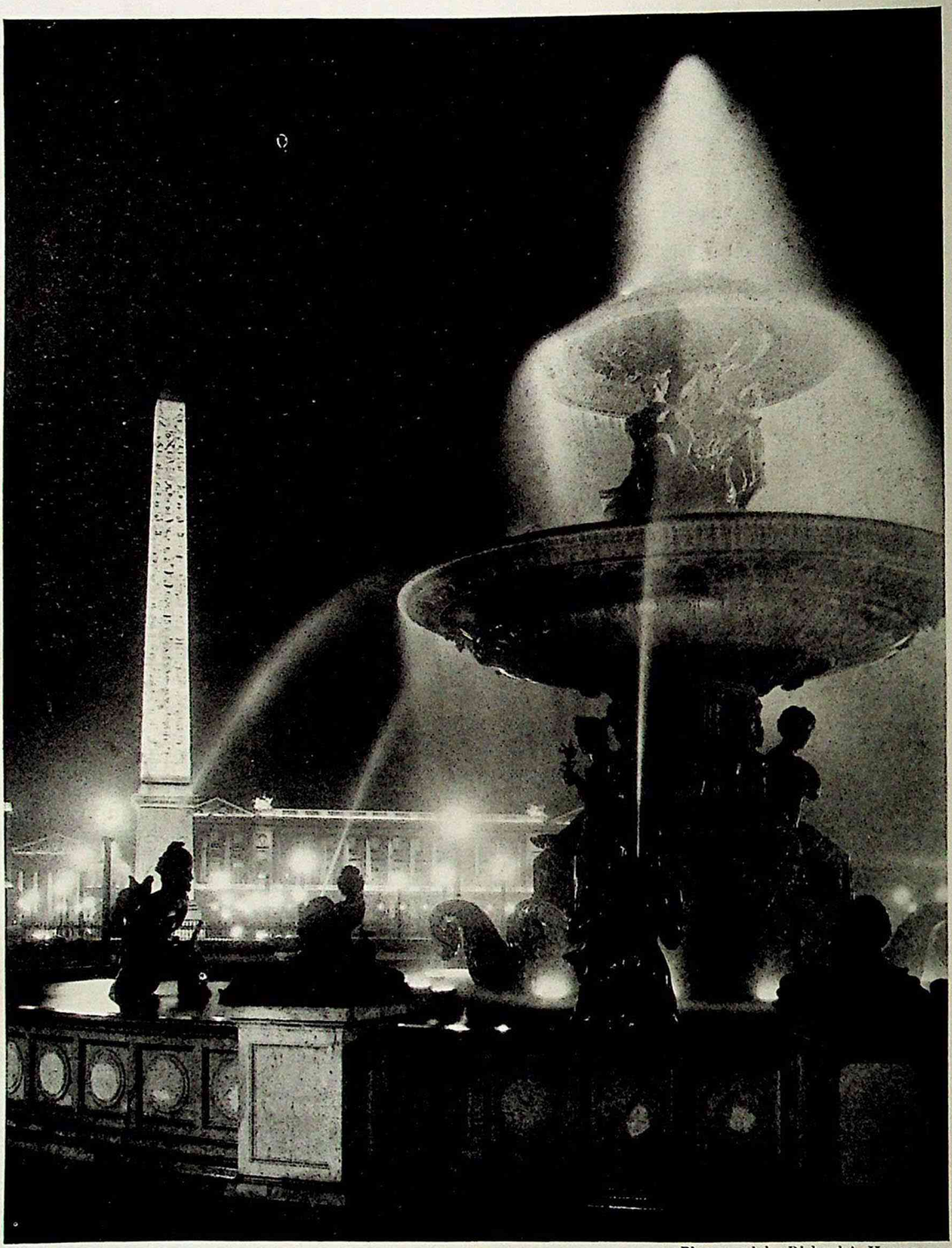
Going to St. Eustache one Sunday to hear Joseph Bonnet play that splendid organ, I found myself among butchers and poultry sellers on the day of their annual church festival.

Before the altar was a table piled with mutton to which little girls with flower crowns and small boys in white-braided sailor suits brought offerings of chickens.

The sermon, recognizing Christ's role as a shepherd and recalling how he would have liked to gather the people of Jerusalem under his wings, had a Rabelaisian succulence and in this church, which was once a Temple of Agriculture, due praise was given to flesh and fowl.

PARIS IN THE GRIP OF STRIKES

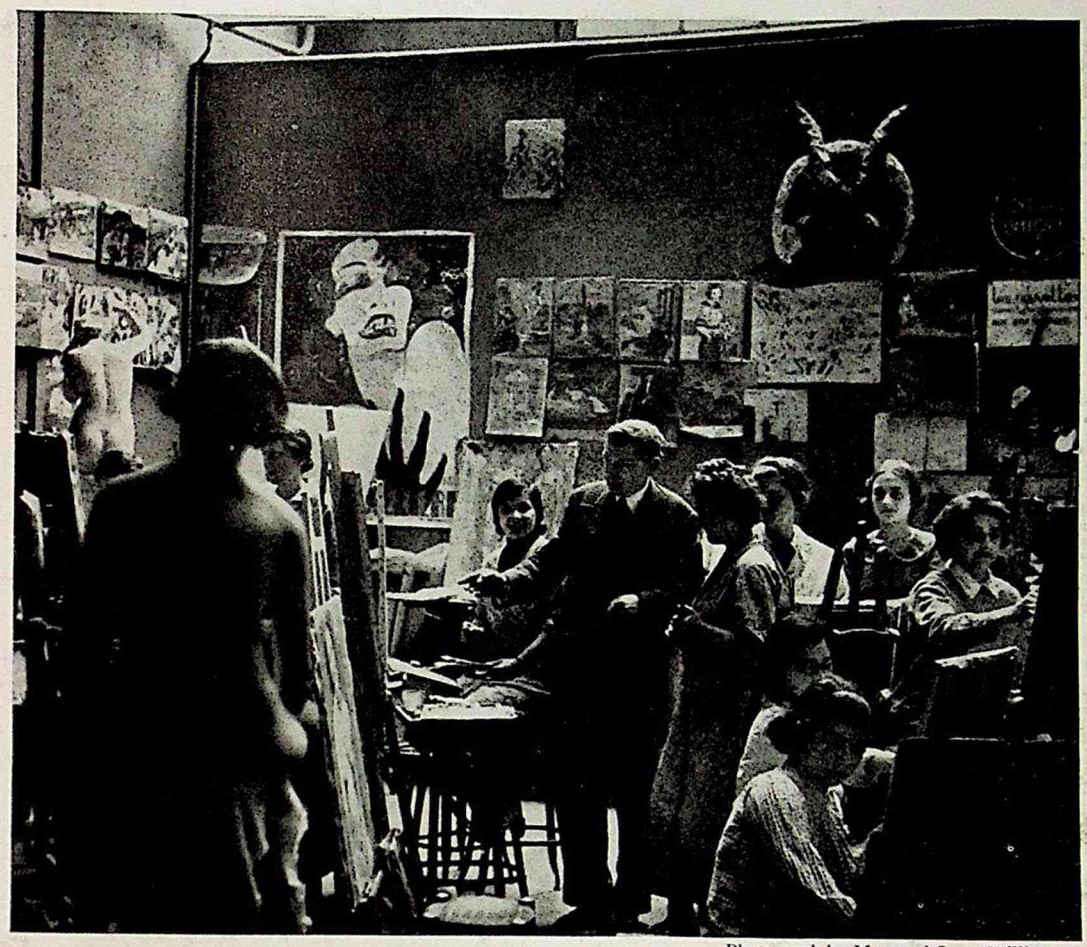
In view of reports that Paris during the strikes last spring was a place of terror, it seems only fair to say that I roamed far and wide through the city all that time and that I not only found good humor and self-control throughout, but gained added admiration for the French.



Photograph by Richard A. Hansen

AN ANCIENT EXCLAMATION POINT PAYS TRIBUTE TO THE AGE OF ELECTRICITY

From a fountain in the Place de la Concorde, one looks north past the glowing façade of the Ministère de la Marine toward the Madeleine, at the left (page 512). The ancient obelisk, designed to say to Rameses II, "How wonderful you are!" now says to Paris, "How beautiful!" Standing on a pedestal of Breton granite, the syenite pillar celebrates the latest of its more than thirty centuries this year, for it was erected here just 100 years ago.



Photograph by Maynard Owen Williams

STUDENTS FROM AS FAR AWAY AS CHINA ARE ENROLLED IN THIS LIFE CLASS AT THE SCHOOL OF FINE ARTS

Painting and sculpture, architecture and engraving are taught at the noted institution, whose best scholars are sent to Rome for four years at State expense. This studio in a 300-year-old building, designed by Mansart, is dimly lighted, but sketches, a theatrical poster, and a one-way traffic sign brighten the walls (page 532).

The self-confidence and determination of the workers was matched by the philosophical calm and genuine sympathy of those who saw power, for the moment at least, slipping from their hands. Paris was not so gay as I had known it under other skies. But it seemed to me more human. Calm and moderation ruled.

What Hyde Park is to England and the radio to the United States, posters are to the French. Grievances are aired and explanations made on the billboards.

Between the two Sundays on which France votes, campaign arguments are marshaled along the streets. This year there were 1,142 candidates in Paris alone and the billboards for 31,204 campaign posters cost the city about $66,000.

Paris newspapers, numbered by the scores, represent a wide range of interest and opinion. The satirical and critical are strongly represented in such names as "Candide," "Gringoire," "Figaro," or "L'Intransigeant." Newspapers, discussing the strikes from all angles, were seldom sensational and we in Paris took events more calmly than did my New York taxi driver, who asked me how I had ever "escaped."

Even on the one day when I did not know where my next meal was coming from, I did rather well. With my pocket-knife I spread oozy masses of *pâté de foie gras* on a yard or so of crusty French bread. Two boat-shaped tarts with their holds running over with wild strawberries were

not hard to swallow and an apple from the Yakima Valley finished an admirable dinner. For finger-bowl, the washbasin, lacking, it is true, a slice of lemon or a sprig of geranium leaf.

It was with a sense of virtue and independence that I made my own bed.

SEVEN O'CLOCK AND NO PLACE TO SIT

Seven stories below me the life of the Boulevard de la Madeleine went on about as usual, except that three million Frenchmen saw seven o'clock arrive with no place to sit. The sidewalk at the Café de la Paix was as bare as Mother Hubbard's cupboard.

As I had my shoes shined in the subway instead of at my hotel, I saw the sign "Shine 10 cents, service not included." When a customer sits down, the chair records the fact and the shine boy pays ten cents to the boss. His only income is from tips. Understand that sign and you can understand the strikes.

"What did you gain from your strike?" I asked my waiter.

"We used to have to pay 60 centimes per person for the use of the napkins, plates, and silverware. Now we keep our tips. But that isn't enough. We want to be workers, not beggars."

"Did you ever hear anything like it?" the man at the next table asked me when the strike deprived him of food. It seemed to me I had, in the Hugo of a century ago describing conditions centuries earlier.

It is January 6, 1482. The Day of the Kings is ending in the Feast of Fools. The university bookseller is talking to the king's furrier. Ten years from now, an unknown named Columbus, sailing into the unknown, is to bring back a rich cargo of new visions. But how can the bookseller know that? His story is as old as Noah, but let's listen:

"I tell you, monsieur, the world's at an end. . . . It's the cursed inventions . . . and above all, the printing press, that German pest! No more manuscripts—no more books! Printing puts an end to bookselling—the end of the world is coming!"

"I see it is, by velvet's coming so much into fashion," sighed the furrier.

Changing styles long favored the Parisian couturier, but today even the "creation" is menaced by such sartorial ditto marks as I saw selling for $1.25 each in an arcade on the once aristocratic Champs-Elysées.

One afternoon a style show walked into the middle of my tea. It moved majestically past, turned and stopped, slipped out of its jackets or coats and, in the nicest and most impersonal way, showed off.

With each change of costume came a striking change of personality. Thirty women, showing three styles, could not have been as different as were those three mannequins, wearing thirty changes of dress!

ART IN THE MAKING

From style I turned to art. At the Salon, one of the most admired paintings was Jean Gabriel Domergue's spirited study of a dusky girl with long limbs, carrying a green parasol aslant against a blue sky. After I took some candid shots in his studio, M. Domergue gave me a card to the School of Fine Arts (page 531).

"My chief interest is in the class," I explained to the model. "Do you mind if I go behind your back to take my pictures?"

"On the contrary," was her eager response.

The life-class students were serious, the students of architecture delightfully gay. In a sculpture class I found one of the most promising pupils to be a slant-eyed and charming Chinese girl from Shanghai.

The dignity of the School of Fine Arts was a protection, but on being welcomed to the renowned Julian's Academy I had to depend on my wits. It was like the Café Momus scene in La Bohème, with myself playing the Philistine among Bohemians.

The model and I flashed signals of helpless sympathy across the barrage of fun, while one serious painter continued his work.

Among the 60,000 students who have studied at Julian's have been many Americans and the walls show the high quality of some of the sculpture and painting done there under the tutelage of such men as Landowski, Bouguereau, Jules Lefebvre and Jean Paul Laurens. But the visitor who arrives after school is out is likely to provide most of the fun. I was never so grateful for fluent, though horrible, French as during the charivari which greeted my visit to the famous Academy in the Street



Photograph by Mondial from European

HARMONY IN THE MIDST OF A STRIKE

The advent of the Popular Front government in May, 1936, was complicated by an outbreak of spontaneous strikes. Instead of staging a walkout, workers in factories, department stores, and hotels simply stopped work and stayed there, refusing to go home. Impromptu orchestras were organized and dances were held on the premises.

of the Dragon. Julian's seemed the gayest spot in Paris.

In the days before Hollywood sent its lenses along tunnels of black silk hose arched overhead like swords above a military bride and groom, the music halls of Paris were unique. Now they have to shoot their lovely ladies up through the floor or drop them through the roof by way of novelty and imitation.

IGNORANCE OF FRENCH A HELP

Personally, I have never known a person who was shocked by a Parisian revue, though ignorance of French can be a help at times. Some of the settings are of rare beauty. A recent one showed "Manon" in the French and in the Hollywood manner. The French interpretation was beautiful, the American version the hit of the show.

Even in Paris, the music hall is surrendering to the movie, but if you are fortunate you may hear a singer whose art is at its best in the intimacy of a small, packed hall.

A girl in a dark-blue gown of classic simplicity appears and time stands still. Meaning and sentiment spring from every nuance of sound and sense. This is pure enchantment and the response of this tight-packed audience is instinctive. Each listens as if over a private wire reaching straight to his heart.

Theatrical Paris has many attractions, even for those who do not speak French. Be sure that the best acting will be at the Comédie Française. Newly redecorated, this is one of the most comfortable theaters in Paris and in it you won't be brought back from the land of illusion by some shrill-voiced harridan shouting "Chocolat glacé!" in your ear.

Molière's verse will flow swiftly perhaps, to avoid singsong, but anyone who can understand a silent movie should be thrilled by the matchless performances at this theater where Molière's vagabond comedians found home and fame.

How could "Tartuffe" possibly be so fresh at its 2,267th performance at a single theater? "Carmen" at the Opéra-

Comique has had almost as many performances.

"The Trial of Mary Dugan" at the Odéon gives Americans a chance to see an American play in a state-supported theater of France. The District Attorney—splendidly done—seems more brutal beside the Seine than at home. One wonders whether the technique of American justice is justly pictured. But it is a treat to see an American play in a city which has so innocently accepted the American movie—slang, chewing gum, "chaps," "gangstairs" and all.

FRENCH VOICES FROM AMERICAN MOUTHS

There are two ways of presenting Hollywood to Paris—in the original "English" version with subtitles in French, or in post-synchronized French with Parisian voices emerging from American mouths. In either case, the name may be changed. "Ah Wilderness" becomes "Impetuous Youth" and "Mr. Deeds Goes to Town" is "Extravagant Man."

The difficulties of matching French words and meanings to the gestures, mannerisms, and lip movements of Hollywood stars can be well understood. The provinces and suburbs like to hear their movies in French. Central Paris, wise in dramatic values, takes its Hollywood straight.

The most serious competitor of the summer theater is not the cinema but the café, for the stage for the "Human Comedy," so dear to Balzac, is the sidewalk as seen from a chair on the boulevards (page 521).

Overlooking all Paris is Montmartre, hill of saints and singers, where Saint Denis, Rusticus, and Eleutherius are supposed to have suffered martyrdom A. D. 270.

Once Montmartre was a place to which one went to hear, sung in brilliant verses, a sardonic résumé of the week's current events. But franc-laden post-war visitors were unable to comprehend sly stanzas in French poking fun at Parisian life along the boulevards and in the ministries, so the Montmartre minstrel was elbowed out by the singer of popular songs.

Buying a glass of brandied cherries as the price of admission, people linger on to savor cabaret life, humming songs they cannot sing and laughing in the wrong places—even as you and I.

Of French cooking I am poorly qualified to speak. The food at my hotel was so good that there was little temptation to indulge in gustatory explorations and I usually ate where mealtime found me.

Some stewed mushrooms on the way to the Odéon, a thick steak after visiting the royal monuments at St. Denis, and a strawberry soufflé in the Elysian Fields were memorable among scores of palatable meals.

Suffice to say that French food is so good that Frenchmen are dissatisfied with all other. But grapefruit, orange juice, and other novelties are rapidly invading a field long jealously guarded.

DINNER WITH COMRADES OF THE TRAIL

To me the finest meal in Paris was one in a modest restaurant in the industrial district. For here were gathered Iacovleff and Gœrger, Penaud and Ferracci, Morizet and Sivel, Reymond, Specht, and as many more—Frenchmen and Parisians with whom I had crossed Asia. For months on end we had lived together, facing difficulties together, sharing each other's pains and triumphs.*

Tomorrow we would go our several ways, they to their several tasks, I back to America on the *Normandie*. But tonight we sang the songs Reymond taught us inside felt yurts or low-topped tents in the Gobi. Nothing in Paris made me feel more at home than these comrades whose "home," like mine, for many months was a moving dot across the face of Asia.

Who better than Montaigne, during the disenchantment following the French Renaissance, has voiced the hope of all who love this city of many moods?

"I love Paris for her own sake and more in her own being than when it is fraught with foreign pomp and borrowed ornaments. I love her so tenderly that even her spots, her blemishes, and her warts are dear to me. God in His mercy free her and chase away all divisions from her."

* See "From the Mediterranean to the Yellow Sea by Motor," by Maynard Owen Williams, NATIONAL GEOGRAPHIC MAGAZINE, November, 1932.

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TRAINS OF TODAY—AND TOMORROW

By J. R. HILDEBRAND

AUTHOR OF "MAN'S PROGRESS IN CONQUERING THE AIR," "ENGLAND'S SUN TRAP ISLE OF WIGHT," "MARCO POLO, WORLD'S GREATEST OVERLAND EXPLORER," "BUDAPEST, TWIN CITY OF THE DANUBE," ETC., IN THE NATIONAL GEOGRAPHIC MAGAZINE

"HOW fast?" I asked the conductor of the Twentieth Century Limited.

"Slowing down now to 70 for a curve. We've been doing 80."

Passengers had been conscious of neither curves nor speed. Just then a town snapped by—a muffled roar of trapped sound, a swift blur of lights, like a movie reel gone "haywire."

A tall young man came along the aisle chatting affably with an elderly train maid.

"That's Mr. Blank," the conductor explained, naming a millionaire sportsman. "Emma's been on this train since it started. In a way she helped raise him, and dozens of other sons of New York and Chicago families, when they were boys traveling back and forth with their parents."

Railroads have their historic liners; the Twentieth Century is the *Mauretania* of the New York Central. They lay colored carpets from gate to platform when the Century leaves Grand Central Terminal. Passengers know each other and greet the train crew as they would the officers and stewards of their favorite steamship.

SPEED—AND DOUGHNUTS

"Speed's the thing now, speed, safety, and comfort," rambled on the veteran conductor. "I remember when they put the first electric lights on the old Empire State Express. And they cut down the New York-Chicago time to 24 hours. There was a great to-do about that; crowds were out at every station to see her whiz by. Now we make it easily in 16½ hours."

"That secretary, now, does he really do much?"

"Last run he typed a contract for a $200,000 deal. Two weeks ago he helped a lawyer and his client make a will. Then he telegraphed ahead for a notary to board the train at Elkhart. The papers were all ready for a safe-deposit box when we reached Chicago."

The Pennsylvania's Broadway Limited is a similar train, making the same time as the Twentieth Century. With rates and running time on competing roads often the same, rivalry now is for added touches of passenger comfort.

"I landed two regular passengers from our competitors," chuckled one passenger agent, "because they liked the doughnuts we give them mornings with their small cups of coffee."

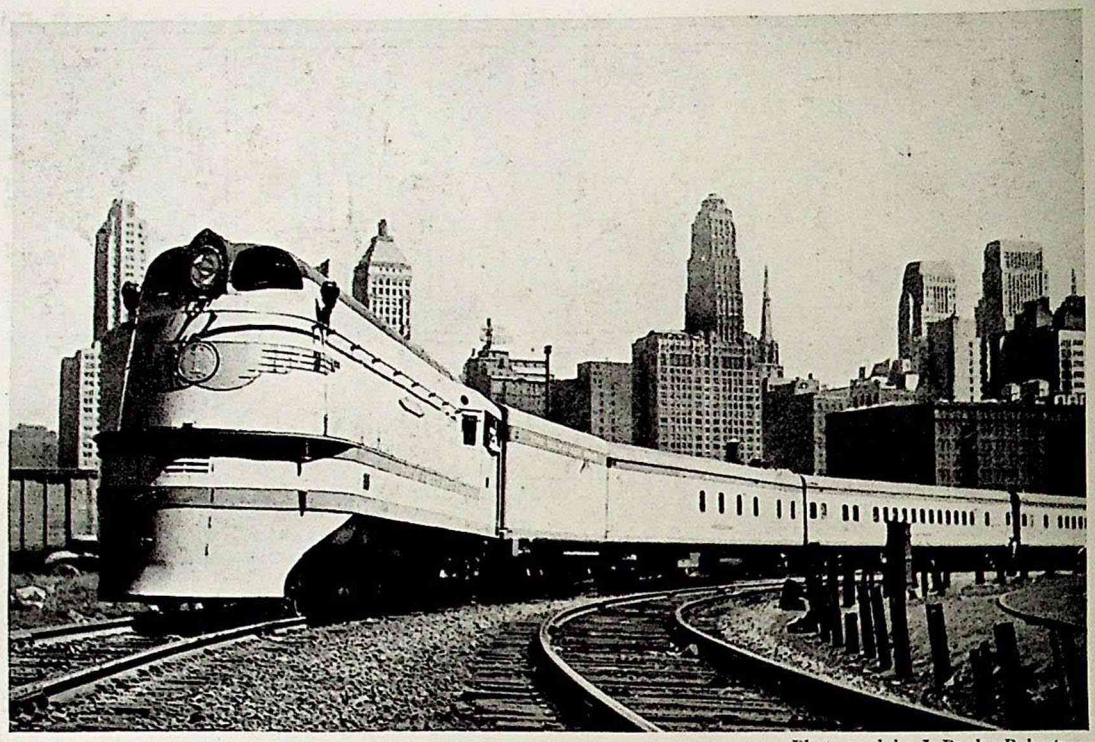
"TRAINS OF TOMORROW"

Over a Chicago travel agent's desk hangs a sign, "Trains of Tomorrow." I asked the alert young clerk to name a few.

She looked puzzled, but, self-possessed, waived the question of destination and reeled off a list: the Sunset Limited, the Hiawatha, the Abraham Lincoln, the Argonaut, the Green Diamond, the Columbine. And, taking breath, the Ak-Sar-Ben, the Super Chief, the Mark Twain Zephyr, the Mountain Bluebird.

The names were redolent; one waited for a Samarkand Limited, a Bali Special, or a Marco Polo Express.

The Mark Twain won my first ride.



Photograph by J. Baylor Roberts

AN AIR-CONDITIONED, STREAMLINED, HIGH-SPEED MODEL, IN MAROON AND ORANGE, LEAVES CHICAGO

Engine wheels are semi-shrouded, the taproom (part of second coach) is windowless and softly lighted, the observation car is beaver-tailed, on the Hiawatha. Its regular 7-hour run between Minneapolis and Chicago calls for a top speed of 106 miles an hour at one place; it has attained 115 miles on short stretches when it was delayed.

There it stood in the station, its stainless steel gleaming like a platinum wedding ring, the humorist's pen signature scrawled on its beetled, glass-incased observation tail.

The cars were "Tom Sawyer," "Huckleberry Finn," and "Injun Joe." "Cars" is not the proper word. They are three "units," for this train is all of one piece—"completely articulated" they call it. The "control room" is in the front end of the forward unit, back of that are a mail compartment and chair seats for 92 passengers.

The whole train weighs not much more than a standard Pullman car. A train made up of a steam engine and two coaches would have 36 or 40 wheels; this one had 16 on four roller-bearing trucks.

Diaphragm vestibules make passing from one unit to the other scarcely perceptible to the passenger were it not for the different decorations of the smoking compartment, the main passenger cabin, and the observation lounge.

Victorian red plush and cupids carved in woodwork have disappeared from most railroads. Decorators and lighting specialists bid for contracts to do the interiors, even those of day coaches. An architect's fee of $28,000 is part of the cost of one club car built this year.

Gray-green carpets, pastel upholstery, rose curtains, aluminum chair frames marked the "rooms" of this Zephyr. Storage space for baggage supplanted overhead racks, radios transmitted the oratory of political campaigns and symphony concert music, a hostess helped make passengers comfortable and amused their children, insulation deadened outside noise.

HANDLING "FRESH AIR"

Constantly a trainman kept a watchful eye on the thermometer and regulated air conditioning.

"The railroads handle more fresh air than any other industry except the movies," an expert said. "High-speed trains would scarcely be practicable without air conditioning. If windows were open, suction would deluge passengers with dust and



BABY'S RATTLE MAKES THE ONLY RACKET ON THIS TRAIN

The Challenger has soundproof, reclining-seat coaches. Aboard are graduate nurses who prepare formulas for infant feeding, amuse the children, care for the sick, and help make passengers comfortable (page 546).

dirt; if they were closed, bad air would suffocate them."

In effect, these clublike compartments are built within a titan sealed tube of stainless steel nearly 200 feet long, rounded at the ends and jointed at two places. A Diesel power unit within the tube rockets it along the rails at 100 miles an hour or more on wheel trucks that have been rubber-insulated to lessen sound and vibration.

The inventive genius and the prolonged experiment that go into making such a carrier are bewildering.

Consider whistles and windows. The safety-glass panes of the latter are set in dumdum putty to prevent cracking. They are hermetically sealed to help keep temperature and humidity at proper levels, and between two panes is an inert gas that eliminates steam or frosting, which would hamper the passengers' view.

Inside the train the sound of the whistle is like the distant moan of a tugboat's signal heard from the top of a New York skyscraper, but it is warranted to be audible five miles; it carries ten miles or so if the wind is right.

I scanned a list of equipment for this short train: coil springs and V-belts, weather stripping, felt, copper screens, cork flooring, and composition table tops; exhaust fans, light fixtures, signal valves, paper cups, air filters, storage batteries, and other items.

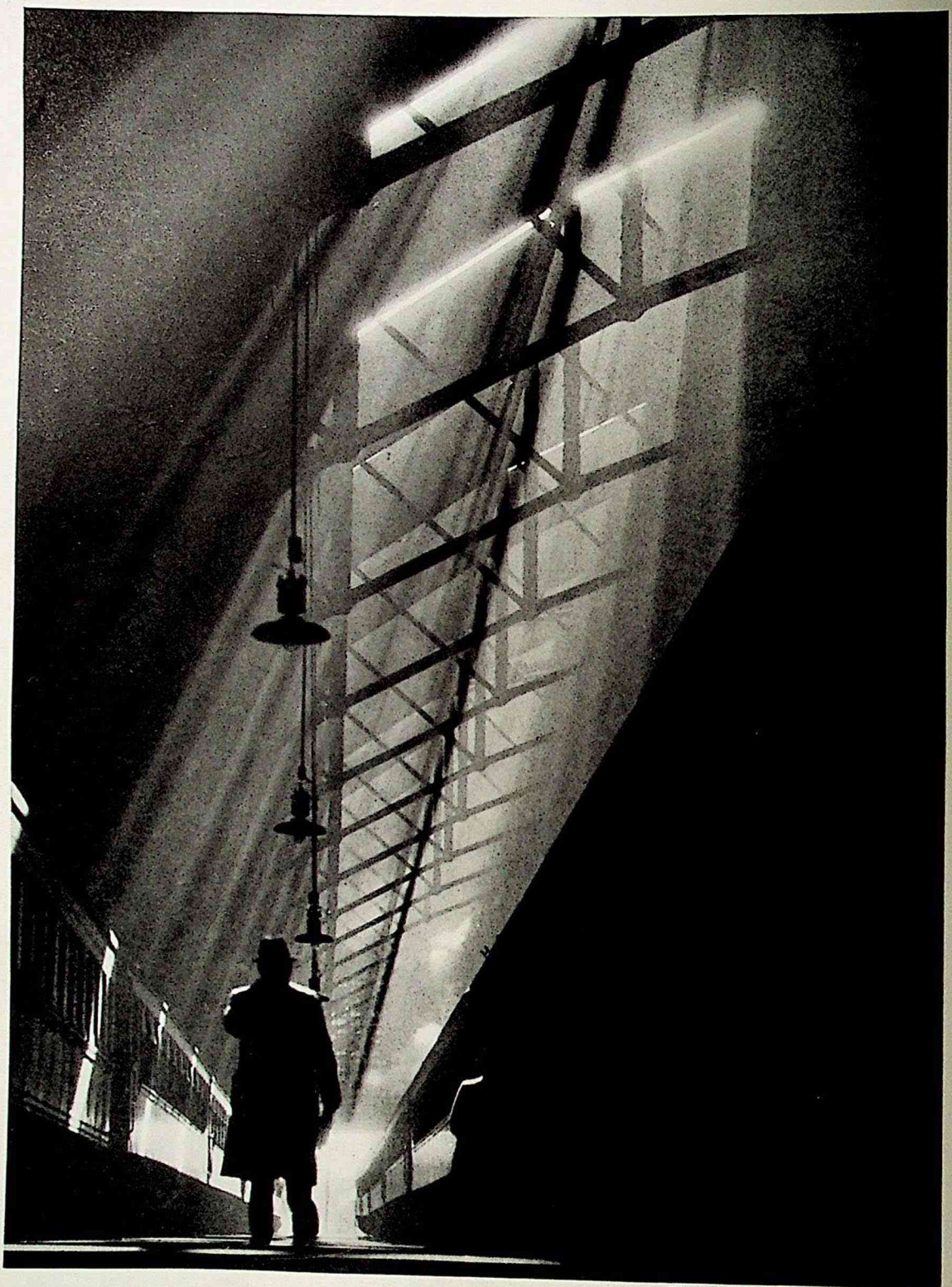
A TRAIN BUILDER'S SHOPPING LIST

"Probably you had to shop around a bit for these?"

A road official produced a requisition sheet listing 107 firms, which gives some idea of the railroads as customers and of the research required to meet their needs.

They let me ride in the control room where the motorman, an erstwhile locomotive engineer, drives the 660-horsepower Diesel engine.

"Motormen, drivers, operators, whatever you call them, all are graduates of the steam-engine school," an official explained. "Starting, stopping, running a Diesel or an electric engine is not hard to learn, but it is knowing every quirk and curve of every mile of track that counts—every switch, every grade, every crossing.



Photograph by William M. Rittase

REMBRANDT WOULD HAVE REJOICED IN SUCH LIGHTING

The vaulted shed of the historic La Salle Street Station, in Chicago, has the aspect of a cathedral. Among famous trains that leave here are the Twentieth Century Limited (see page 535), the Golden State Limited, the Rocky Mountain Limited, and the Wolverine.

"The engineman, by any name, always will be the pilot of any craft on rails."

It was much like sitting beside the driver of a sleek automobile, up there in the control room, busy windshield wipers oscillating on the half-dome of safety glass about us, gleaming instrument board at hand level, the motorman relaxed and casual, but eyes fixed on signals and track ahead.

The running was smooth as an automobile gliding over a superbly surfaced road, but the speed would have incited the most indulgent traffic policeman to instant action. Up to 75, then 80, past 90, on to 93 climbed the speedometer.

"Oh, yes, we could make well over a hundred; often do, but no need now," explained the motorman. One hand or one foot always was on the "dead-man control." Had he let go that, the power would automatically have been cut off and the emergency brakes applied.

"SLOW DOWN," TO 90 MILES AN HOUR!

For safety's sake all railroads have "slow orders" for certain stretches. An engineer showed me one, dated May 29, 1935, which read, "Articulated trains must not *exceed* 90 miles an hour on eastward track between milepost 195 and milepost 198."

"This streamlining, is that decoration or does it help speed?"

"Below 50 miles, no. Above that, where we run most of the time, considerably. They had scale models of this train tried out in a laboratory. Tests showed that at 95 miles an hour streamlining reduced the 'drag,' or wind resistance to motion, by 47 per cent."

The only flaw in the short, pioneer Zephyrs is their capacity. Passengers grow dispirited when all space is sold out, sometimes for days in advance.

In venerable Philadelphia I saw them building the ultramodern 10-unit trains that will run from Chicago to Denver, and the 6-unit speedsters for the daily "flights" to St. Paul and Minneapolis. There, too, under construction was the Santa Fe's new 9-car Super Chief.

A Zephyr train starts out in life as a coil of stainless steel, an alloy of ordinary steel, nickel, and chromium.

The two ends of each coil are snipped off for a pulling machine, to assure its tensile strength, and for the "bend test," which may reveal various technical defects.

Piles of acceptable coils, and flat sheets, too, are card-indexed and guarded like bullion in a bank, even though they may be stacked in the open, since the elements do not corrode them.

BOLTS OF STEEL RIBBON

I pointed to one coil of the gleaming metal, wrapped like silvery ribbon 10 inches wide in a bolt two feet thick.

"How much is that worth?"

The attendant consulted his file and quoted "$355."

Like the stone money of the island of Yap, this wealth is not very vulnerable to theft, since the coil weighed 710 pounds.

When car making starts, a mechanic requisitions coils of desired width, slips one end into the forming rolls, which shape it, and as it moves along the rolls he arc-welds the other end to a fresh coil.

A radiac stone saw clips the formed pieces to the exact fraction-inch length of specifications.

Contour machines work on other parts; curved sheathing is beaten out by hand. All these parts are numbered and thus assembled in the jig for side frames, and these sides are then swung over by cranes to be welded to center sill, floor, and roof.

Hundreds of parts are "shot-welded," and the name is appropriate, for by this time the massive metal tube looks as if it had been dented by enough bullets to fight the Battle of the Marne.

Stainless steel is held by its proponents to be of special value in train building because of its high strength in proportion to weight, and no extra thickness is needed to allow for corrosion. The roofing of a stainless-steel train is only two one-hundredths of an inch thick. Its use reduces the weight of train equipment per passenger by more than half.

Cor-Ten and aluminum are being used for the same reason—lightening the load. It takes about a ton of train equipment to move a ton of freight, which ton of freight the railroads haul for a cent a mile. It requires from two to seven tons of train to move one passenger, and the railroads now are hauling him for 2 cents, and less, a mile.

For twenty years or more stainless steel has been used for kitchen utensils. But its structural use was limited because ordinary welding processes destroyed the very qualities which made it desirable. Not until an inventor adapted the shot-welding process could it be employed for train building.



Photograph by J. Baylor Roberts

MOST OF MANHATTAN'S FREIGHT MUST FLOAT TO TERMINALS

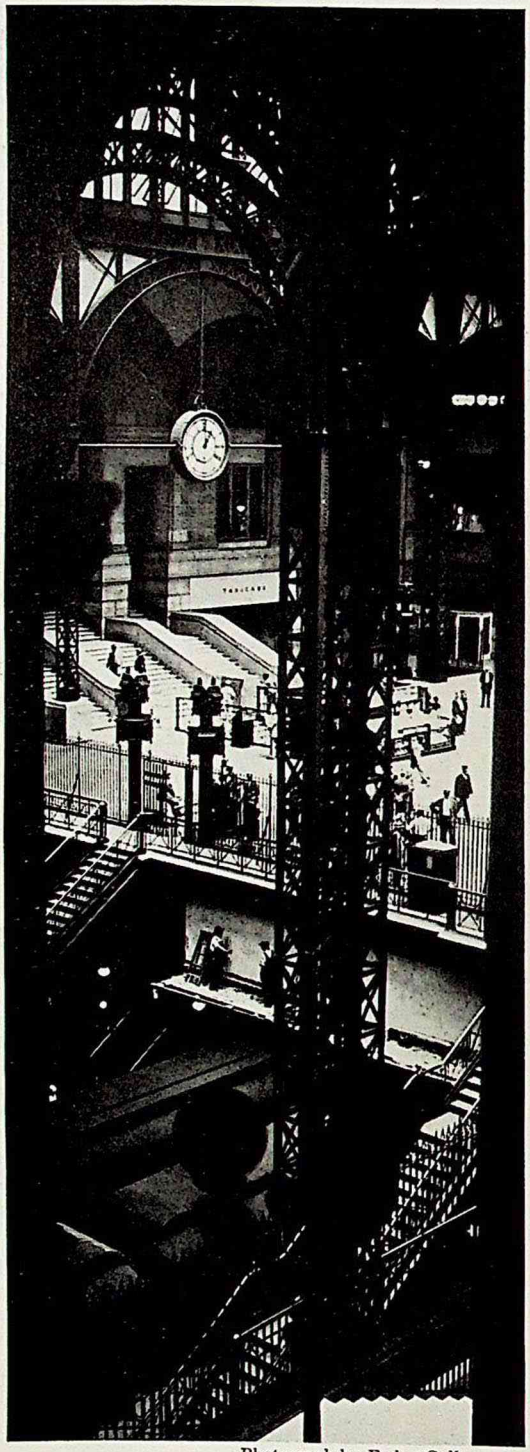
Some of the float bridges, such as these, have a capacity of 22 cars. The railroads' New York marine department numbers some 1,900 vessels—craft ranging from tugs and ferries to grain boats, refrigerator barges, and hoisting lighters. Now wireless telephones facilitate the operation of these harbor vessels (page 573).



Photograph by Fairchild Aerial Surveys

BY RAIL, SHIP, AND BRIDGE MAN CONQUERS THE WATER-CLEFT GEOGRAPHY OF NEW YORK CITY

Hell Gate Bridge (right) carries through trains between Washington and Boston. The new Triborough Bridge, opened in July, 1936, bears the heavy automobile traffic from Queens, Long Island (foreground), across Ward's Island and over a truss section into the Bronx (upper right), or over the vertical lift bridge from Randall's Island (upper center) across the Harlem River into Manhattan (upper left). Beneath the Hell Gate span of both bridges (foreground) is the main water channel for coastal steamers between New York and Boston.



Photograph by Ewing Galloway

A LACY STEEL BRIDGE SPANS TUNNEL TRACKS

Far beneath congested streets and under this vast concourse glide trains entering New York's Pennsylvania Station (page 583). The highest point of the four miles of station tracks is nine feet below sea level. It required 27,000 tons of steel for the 8-acre building.

Shot welding, in essence, consists of clamping piece to piece and then shooting an electric charge, exactly timed, through the pieces. To the layman it looks like nailing strips of steel by lightning bolts, only there remain no "nails," or rivets.

Attached to the welding machine that clicks along like the put-put of a motorboat is a recording device that registers on a ticker tape the effectiveness of each weld. If a weld registers offside on this tape, and thus is imperfect, the device automatically rings a bell and a foreman comes running to spot the trouble.

Except for a break beneath, where the center sill runs lengthwise, a stainless steel car literally *is* a mammoth tube. Each member—the floor, the floor beams, the side walls, the "skirts," the carlines, or "rafters"—is designed to withstand its part of strain, pull, and even collision impact.

When the train is moving, the diaphragm vestibules, the doors and the windows, are flush with the corrugated surface, thus avoiding any niches which would catch the air and defeat streamline benefits.

CROWDS WATCH THE TRAINS GO BY

As I rode the Zephyr, the unexpected sight was the crowds.

Out West they again are coming down to way stations and crossroads to see the trains go by. They come by the thousands, in roadsters and afoot, some in Model T's; I counted five horse and buggy teams.

They gather for the silvery streak of the stainless-steel Zephyrs, for the polished angleworm dash of the "Cities" fleet, which plies from Chicago out to Portland, to Denver, to San Francisco and to Los Angeles; for the red-and-yellow splotch of the Hiawatha against Wisconsin's green meadows; for the sturdy, square-jawed "400," steaming standard locomotive defiance to Diesel and electrification speed, and the Indian-head contours of Hollywood's pet Chiefs.

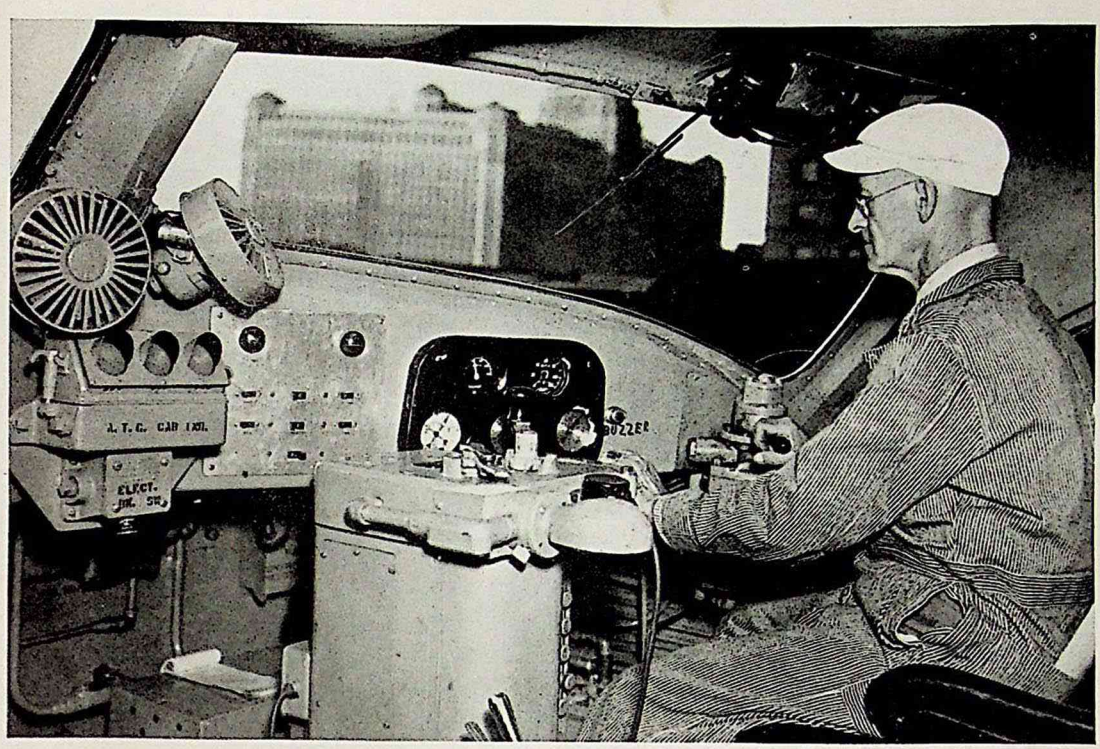
"It's been ten years since I saw crowds waving to trains that didn't have the President aboard," said an eastern passenger.

At Omaha I abandoned the Burlington's Zephyr for the Union Pacific's Challenger.

"A challenge to what?" I inquired.

"A challenge to people who ride our own bus lines," replied an official of that historic railroad.

The Challenger—its name was suggested by a veteran employee—is a train of standard-size and weight day coaches, drawn



Photograph by J. Baylor Roberts

A DIESEL ENGINE WINDOW FRAMES CHICAGO'S MAMMOTH MERCHANDISE MART

Theoretically, the engineer need not look out, because an electric circuit shows green, yellow, or red lights on the panel to the left in the picture. An automatic safety control blows a whistle should he exceed the allowable speed, then cuts off the power and sets the brakes should he fail to heed the whistle warning. The device also indicates too close proximity to a train ahead or a switch set wrong. The unique 5-acre Merchandise Mart is built over tracks of the Chicago and North Western Railway. The railroad retains ownership of the area on which its tracks operate. It sold "air lots," representing possession of the space above ground occupied by the entire building, and numerous miniature ground lots necessary to sink caissons. The air was actually subdivided into lots and the diagram of this aerial real estate is filed in the office of the Recorder of Deeds of Cook County, Illinois.

by a steam locomotive, also carrying tourist sleepers. You ride it for the minimum rates, although it makes the same time between Chicago and the Coast as the crack Los Angeles Limited.

The Union Pacific had no prejudices against its own bus travel, but it believed it could carry passengers for long distances more speedily, more economically, and more comfortably on its trains. So it sent out scouts to interview hundreds of bus passengers; even the president observed them.

WHAT THE PASSENGERS WANTED

"We found we had to do far more than meet the price of the bus ticket," an official explained. "Some said train meals cost too much. Others hesitated to go from coaches to dining cars where they might meet friends traveling Pullman. Silly, perhaps, but that was human nature as we found it.

"Certain small charges irked passengers. We would spend half a million dollars to put a train in service, then collect pennies for towels, drinking cups, pillows.

"Passengers were stranded with baggage in day coaches, with no one to help them get it off the car, and many thrifty folk balked at paying redcaps in the stations.

"Coach passengers were cramped after sitting in straight-back seats. Lights burned brightly all night long, and brakemen would call out stations throughout the night.

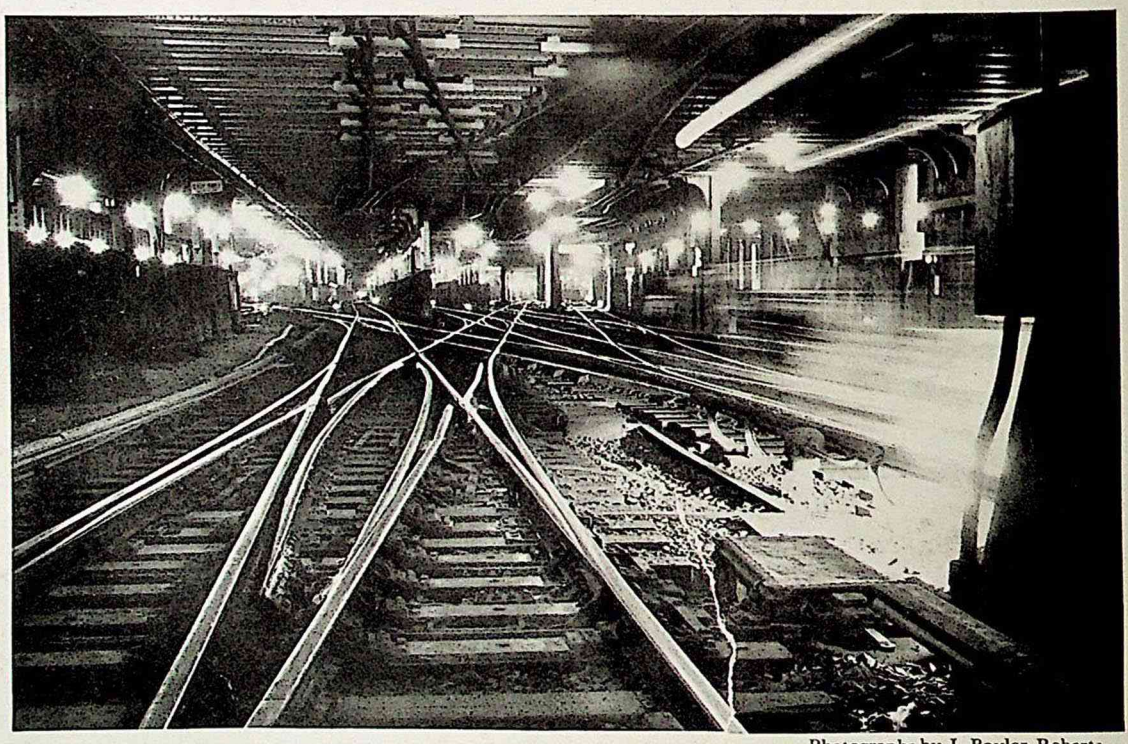
"Women were afraid of meeting undesirable persons in coaches. They could not get proper food, or get it cheaply, for their babies. And women were 62 per cent of our patrons.

"Every time train crews changed, each passenger was disturbed by a new conductor to punch his ticket or to demand a coupon the last ticket taker had given him."



IT'S GREEK, ALSO ITALIAN, FRENCH, AND SIGN LANGUAGE TO THE LAYMAN

At this Duane Street Terminal of the Erie Railroad, in New York City, some 500 dealers attend the daily fruit auctions. There is a babel of tongues, but the bidding is largely by signals, a tilt of cigar, despite the sign, a finger to left eyebrow. When buying is brisk, the bidders jump from their seats like schoolboys playing "handies" to attract the auctioneer's attention.



Photographs by J. Baylor Roberts

BENEATH SKYSCRAPERS AND BUSY STREETS BURROW GRAND CENTRAL TRACKS

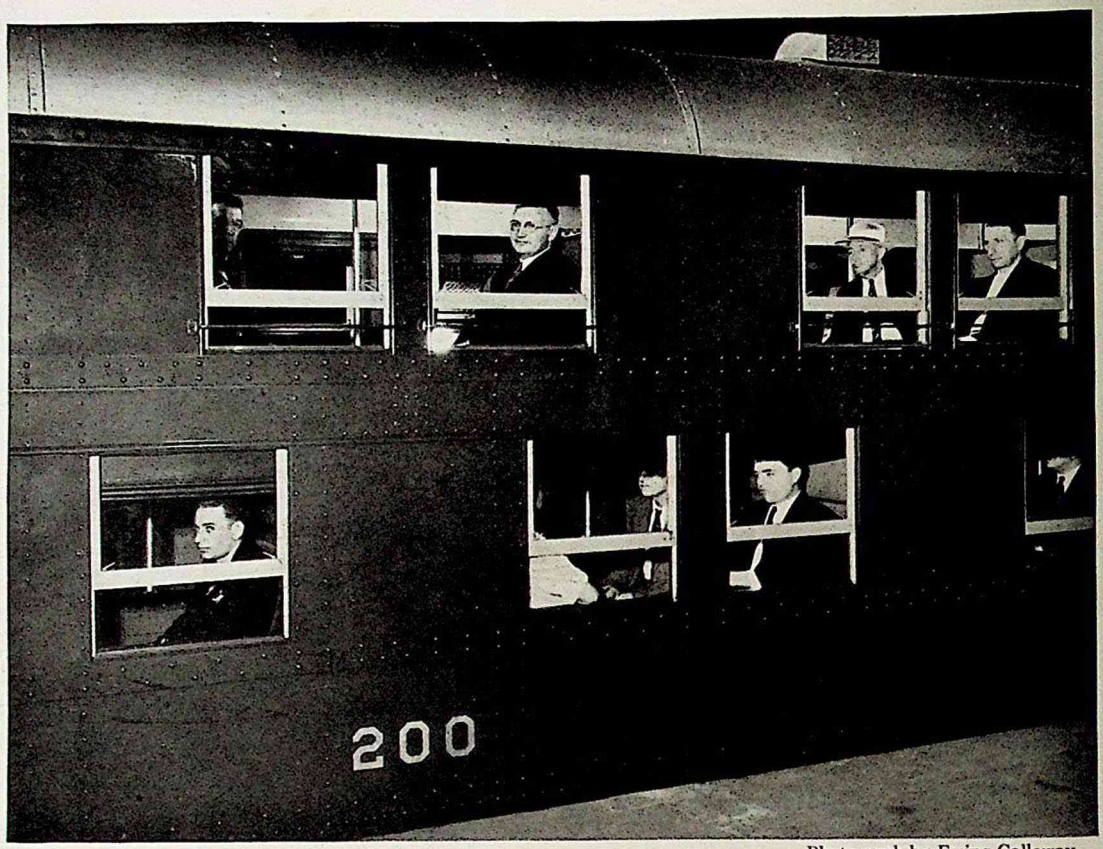
In rush hours 60 trains an hour pass over these rails to and from the platform tracks beyond the lights. The columns are some of thousands which support skyscrapers and streets above the tracks (see page 580).



Photograph by Ewing Galloway

IT TOOK 79 TICKET SELLERS TO HANDLE THE LABOR DAY CROWDS

To sister's wedding, or ailing mother's bedside, home after a hard day's work, vacation in a National Park, or quest of a job—there is constant drama in the ticket window line. Enough commuters to populate the city of Troy, New York, come and go daily during the 9 o'clock and 5 o'clock rush hours at Grand Central Terminal. The majority head direct for subways or pour through underground passages to adjacent skyscrapers (page 582).



Photograph by Ewing Galloway

A DOUBLE-DECKER FOR LONG ISLAND COMMUTERS

Clearance limitations make it impossible to place seats on two floors, as in motorbusses. Here the lower tiers are reached by a step down from the center aisle; the uppers are just as commodious. Because the car's walls are aluminum and it seats 120 passengers, as compared with 76 in the standard coach, a new "low" in weight per passenger is attained in coaches of its length.

All these and many other complaints were codified, considered, and the Challenger was born.

PAINT AND ROAST PORK

The train's name was painted in bright colors on the exteriors of the coaches; the interiors were decorated in subdued designs. Upholstery of adjustable, individual seats varies. Two diners were refurnished, in coffee-shop style; menus offer 25-cent breakfasts and 35-cent dinners. The latter, the day I was aboard, afforded:

Roast Loin of Pork, Apple Sauce
New Potatoes in Cream
Asparagus on Toast
Hot Dinner Rolls
Coffee Tea Milk

Cooking and service were comparable to those on the usual dining car. About half the patrons give tips, the waiter told me, but he serves twice as many as on the usual runs.

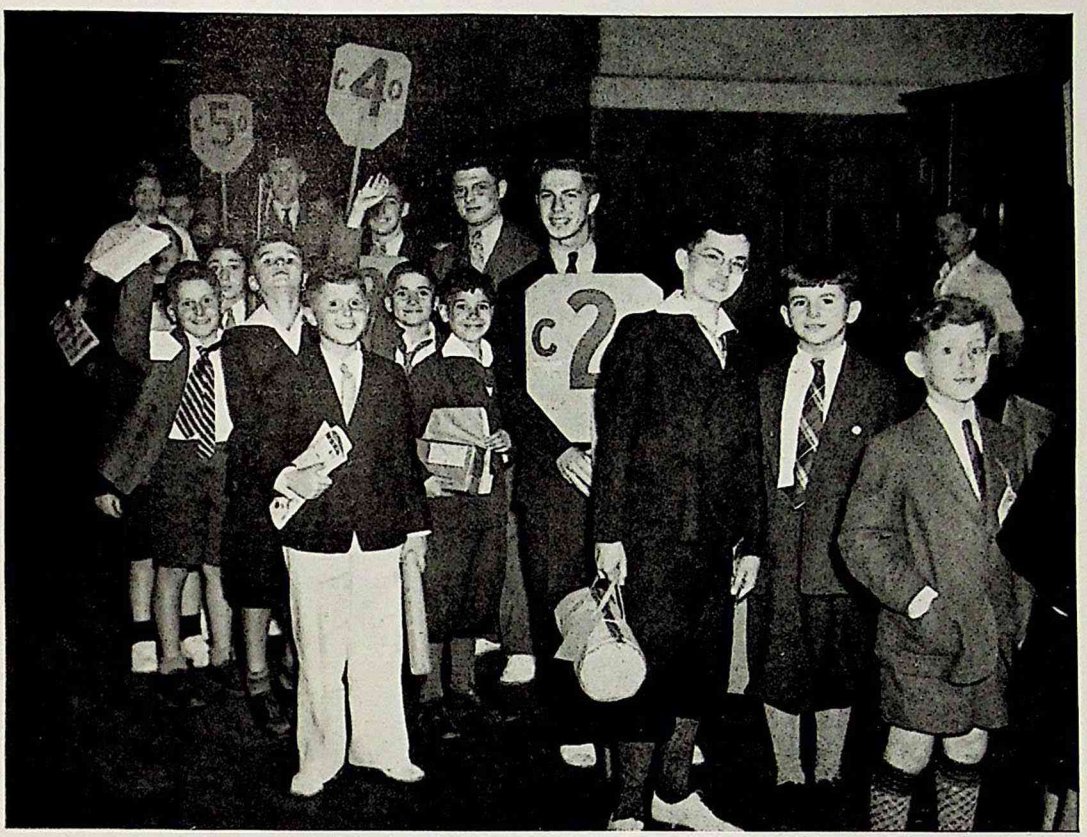
When meal service is concluded, the two diners are used as club cars, for reading, writing, smoking, beverage service, or card games. As I retired, a group of college boys and girls had turned on the radio for an impromptu dance.

Normal lighting of the coaches is indirect. At 10 o'clock these lights go off, and there remain only dim blue lights and amber floor lights, enough to avoid stumbling in the aisles. But there are individual lights for late readers. Porters pass out pillows.

Tickets are collected once for all. Stations are not called; if any passenger must get off during the night he is awakened individually. Baggage is carried to the platform by a car porter and given to a redcap who must not take a tip. The road pays him.

And he won't take it. I tried it out.

Two cars, or more, behind the mail and baggage are reserved for women. Aboard



Photograph from Pictures, Inc.

"ALL ABOARD—AND YOUR FIRST SWIM TONIGHT!"

A councilor announces the glad news to boys on their way to a large New England camp, lined up under squad insignia, at Grand Central Terminal. More than 10,000 boys and girls left on special camp trains the first week in July. On one day it required 257 sleepers, parlor cars, and coaches to transport groups to 130 camps.

are stewardesses who must be trained nurses, preferably also college graduates. They give first aid, assist the aged, infirm, and young, care for children traveling alone, look after others when their parents dine or wish to rest (page 537).

There were fourteen children on half-fare tickets, and seven under five years, who were carried free, the day I was aboard.

"Yes, I have seen death on a train," a stewardess recalled. "And a baby born? Almost. But we wired ahead for an ambulance in the first town where there was a good hospital. Later the mother wrote me gratefully and enclosed a picture of the child."

She drew the snapshot from her bag.

A MUSEUM ON WHEELS

Back from Denver to Chicago I rode the City of Denver, then in operation just one week, pioneering in luxury as the Challenger was in comfort (page 575).

Thereon one may lounge in a frontier shack, authentic reproduction of a western tavern of the post-Civil War period. From its timber rafters hang faithful prototypes of kerosene lamps; walls and ceilings are white pine boards, of rough finish and uneven width, face nailed. Men hang their hats on iron spikes.

From the Union Pacific's historic museum have been assembled rifles, horns, portraits of famous pioneers, showboat and melodrama programs, old railroad schedules, one counseling those who have cattle for shipment to have them down at the station by 10 o'clock the following Tuesday morning, and faded newspaper clippings of the General Grant period.

One may sleep in the newest type of Pullman section, which has aluminum sliding panels that operate on the principle of a rolltop desk, to give greater privacy than berth curtains. Dressing platforms and windows are provided for upper berths.

This sister of the Portland, Los Angeles, and San Francisco "City" trains is a standard-size streamliner and has twelve aluminum cars. Its two 1,200-horsepower, 16-cylinder Diesel engines enable it to make the run in 16 hours, cutting 9½ hours from previous fastest schedules.

The adaptation of the Diesel engine for train motive power, by lightening their weight and lessening vibration, is a wonder tale of American inventive genius.

The story goes that after the units of 1,200 horsepower were completed, the famous engineer who supervises this development called in his associates and said, in effect, "You boys had better be figuring on even more horsepower. These railroads are insatiable. Give 'em 1,200 and in a few months they will be wanting 2,400."

That afternoon came a telephone call from the Santa Fe.

"Can you build us Diesel units that will give 3,600 horsepower to run our new Super Chief on a 39-hour schedule between Chicago and Los Angeles? How soon can you deliver the job?"

The order was accepted; the units are nearly completed.

RAILROADS AND RESEARCH

The railroads have been charged with being asleep at the research switch. Larger railroads have research and testing staffs of their own. In addition, all join in a research program carried on jointly through the Association of American Railroads. The railroads have paid more than two million dollars to study air braking alone. Recently $125,000 was appropriated for testing new types of draft gears.

To provide ready reference for their laboratory engineers, the railroads have compiled a "Brief Digest of Research and Experimentation," which merely lists and concisely describes each project. The résumé is printed in two book-size volumes of 730 pages, and indexes 488 items of research in laboratory, shop, and on rail.

One extensive project includes 70 subjects pertaining to locomotives, 15 to signals, 65 to freight cars, 38 to passenger cars, and 84 to other lines of inquiry.

All new equipment must gear in with that already in use. A new car, a new brake, or a new coupling device must permit the car to be operated on practically all existing track. If it doesn't, national transportation will be slowed up as badly as it was in the bygone days of various gauges for tracks.

Railroads purchase more different kinds of products than any other industry. They challenge experts of factory, farm, and mine to meet their special requirements.

On railroad payrolls are listed paint chemists, radio engineers, animal-husbandry experts, illumination specialists, artists, chefs, surgeons, printers, produce buyers, architects, writers, seamstresses, butchers, geologists.

BUYING FREIGHT CARS AND LEAD PENCILS

For one example, the Pennsylvania Railroad, in 1936, is buying more than 100,000 different kinds and sizes of material. Specification sheets fill a small library.

That road is spending $25,000,000 this year for 10,000 new freight cars and $3,610 for lead pencils. The freight-car order will give a year's work to 2,000 men direct and to about 6,000 more in the basic industries involved.

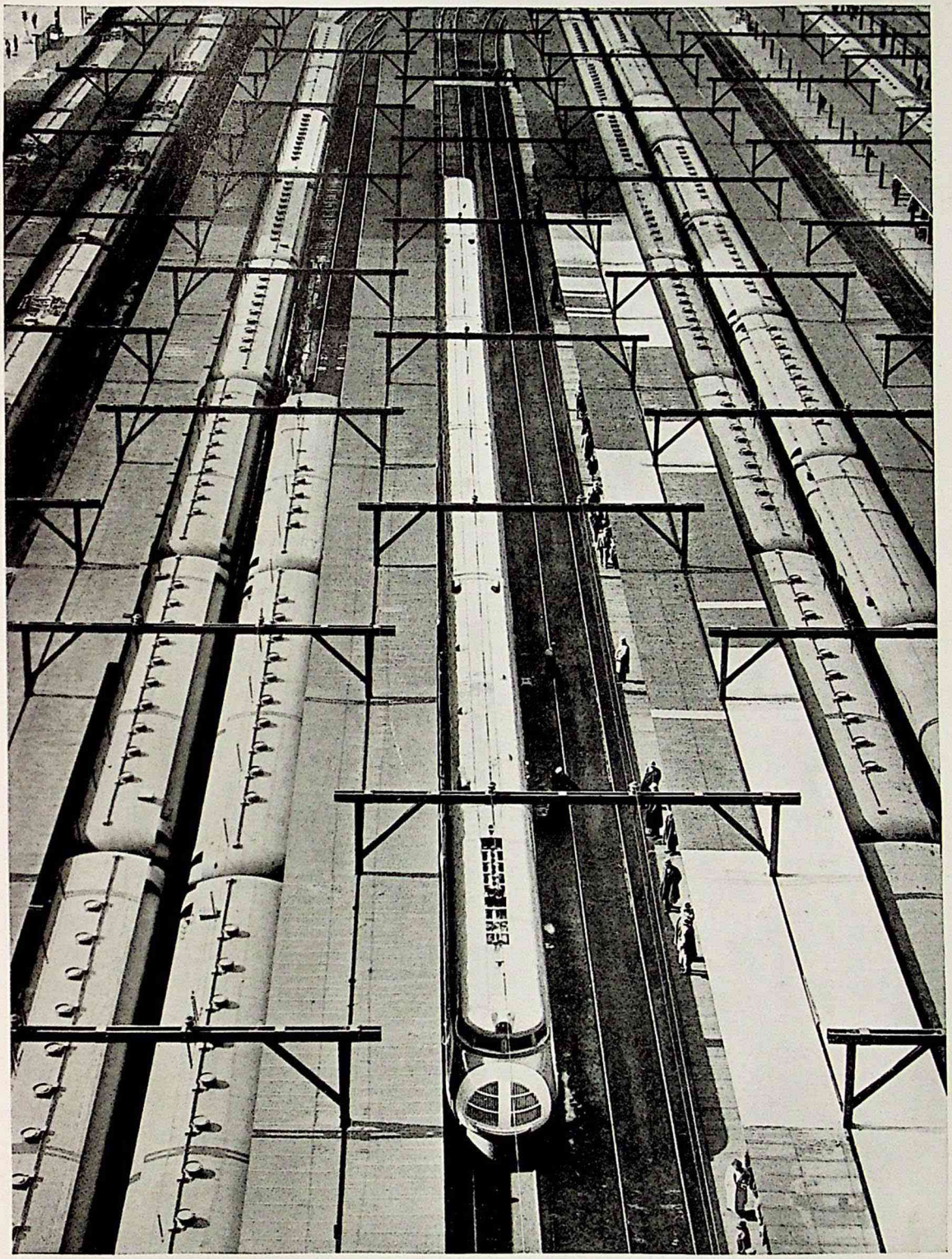
Nearly half a million dollars will be expended for printed forms, a million and a half dollars for silver, dishes, and utensils for dining cars, $7,248 for paper towels. When the road suggests that you save your timetable for reference, it is trying to keep within its $132,960 allotment for that item.

Having ridden behind steam locomotives and Diesel engines, the rail explorer also must experience the 656-mile electrified ride over four mountain ranges on the Milwaukee's Olympian, or speed between Washington, D. C., and New York on the Pennsylvania's Congressional.

Just 100 years ago the news of his father's death did not reach John Quincy Adams in Washington, D. C., for five days. Special arrangements were made to speed the statesman home; they whisked him as far as New York in 45 hours.

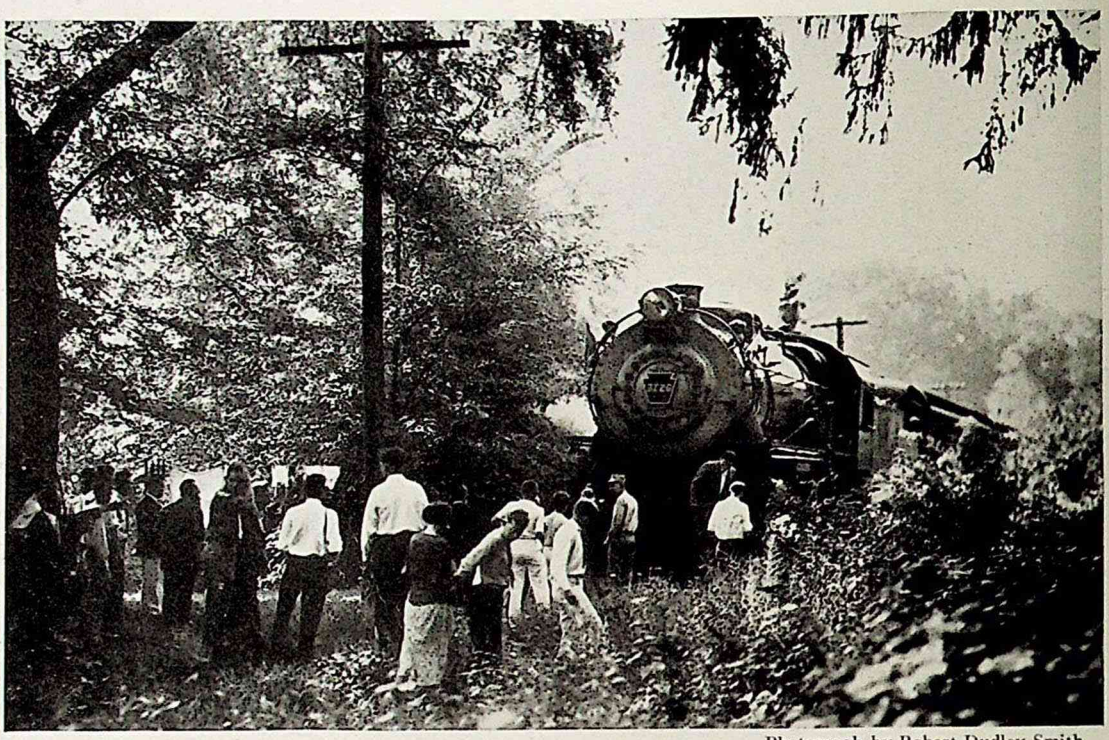
"He made six changes of conveyance en route," the historian relates. "His own carriage took him to Baltimore, a steamboat from Baltimore to Frenchtown to the head of Chesapeake Bay, a stagecoach to New Castle, Delaware, a boat from that place to Philadelphia; a stage from thence to New Brunswick, at which place he took a steamboat to New York City."

Today Mr. Adams could buy a ticket for $4.55 and leave any hour between dawn and midnight to ride the 226½ miles to New York in less than four hours!



A MODERN WESTERN FLYER VISITS HISTORIC BROAD STREET STATION

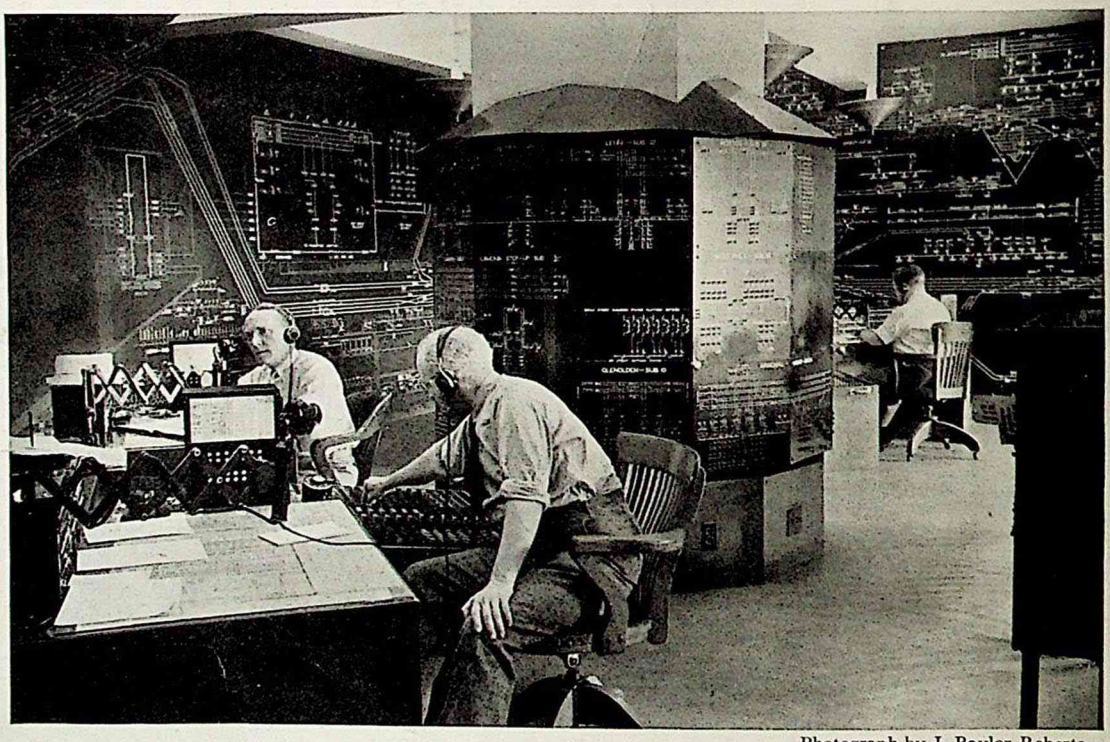
The Union Pacific's Diesel-engine, streamlined City of Portland was viewed by thousands at Philadelphia and at other terminals on its exhibition tour. The umbrella platform shelters were built when the vast arched shed burned down. Now this venerable station, with its elevated approach, often called the "Chinese Wall," is to be removed as part of the improvements already begun with the erection of the Pennsylvania's monumental main passenger station at Thirtieth Street.



Photograph by Robert Dudley Smith

PASSENGERS ADMIRE WILD FLOWERS ON AN "OFF THE BEATEN TRACK" EXCURSION

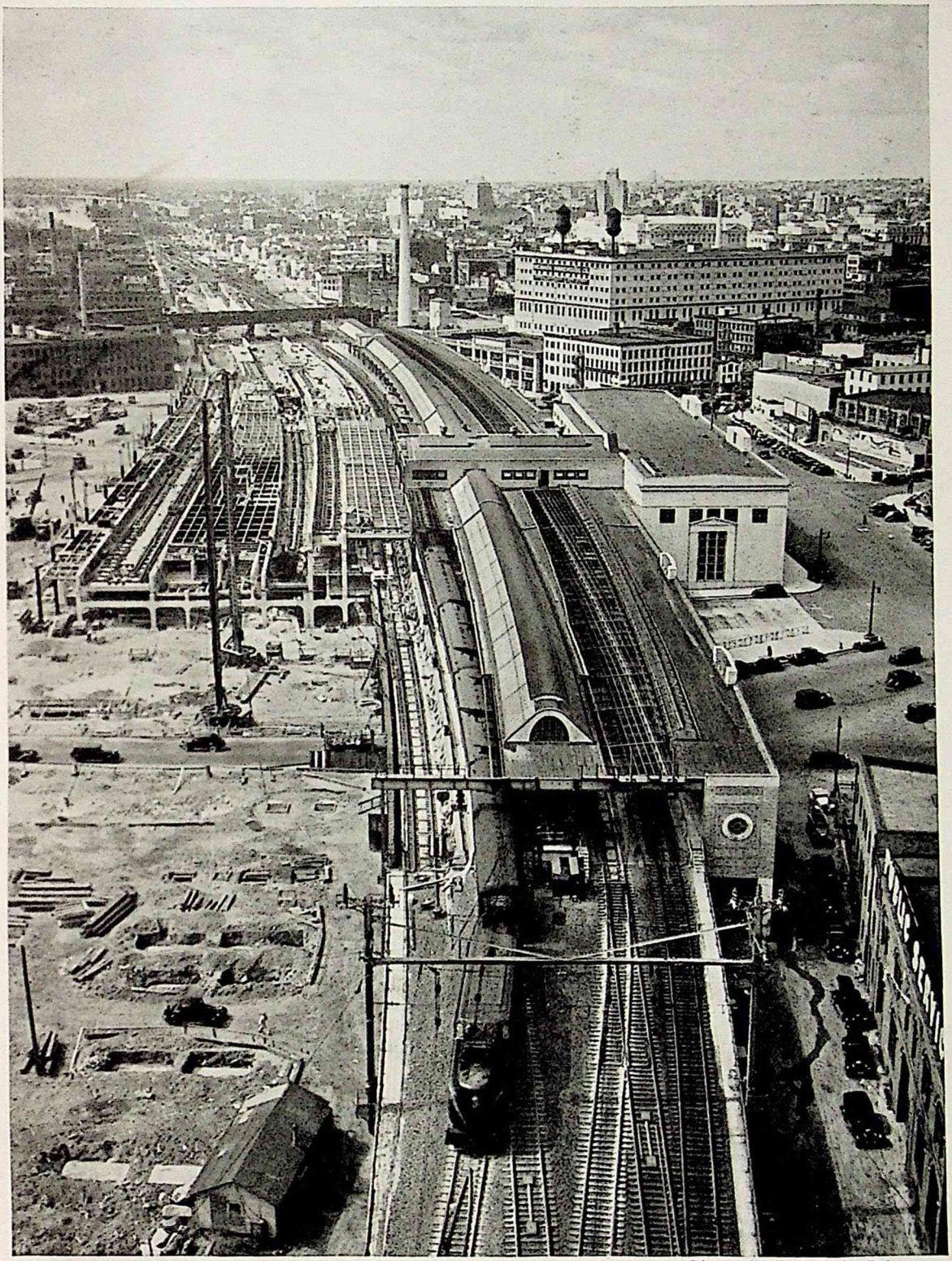
This special took more than 500 people on a 270-mile tour out of Philadelphia into the mountains of eastern Pennsylvania and down the Susquehanna into Maryland. "Hiker Trains," "Bicycle Excursions," "Mystery Trips," and "Fisherman's Specials" are a few types of week-end runs.



Photograph by J. Baylor Roberts

THE POWER DIRECTOR IS A KEY MAN OF ELECTRIFIED LINES

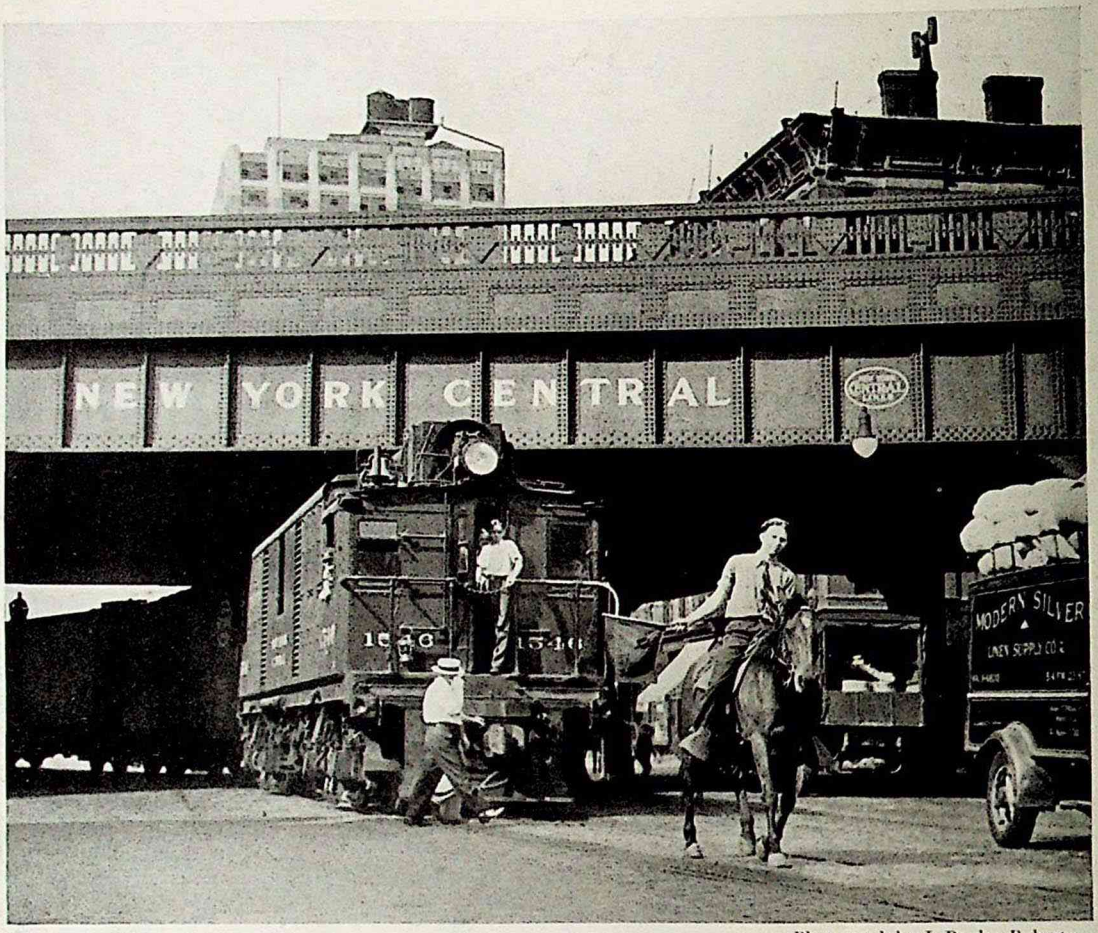
In the control room at the Thirtieth Street Pennsylvania Station in Philadelphia miniature boards show the layout of trolley circuits on each track. White, green, and red lights located at the ends of each trolley section and on either side of a power switch tell what circuits are in service.



Photograph by J. Baylor Roberts

HERE TRAINS, STREETCARS, BUSSES, AND SUBWAYS CONVERGE

Four kinds of transportation enter Newark's new Pennsylvania Station on four levels. City transit lines take to a subway, while the intercity trains from downtown New York, via the Hudson tubes, will emerge on elevated tracks still under construction on the left. Busses and taxicabs arrive on surface level. Through trains pass under the long shed on a fourth level. Escalators convey travelers to the covered passageway across the roof.



Photograph by J. Baylor Roberts

TRAIN AHOY! AND A "WEST SIDE COWBOY" AHEAD

On sectors of Tenth Avenue riders go ahead of freight trains, waving red flags. Since 1849 a city ordinance has compelled this safety measure, but the "forty-niners" soon will disappear. Already skyscraper warehouses stand like top-heavy skeletons where lower stories have been cut away around the supports to make way for new tracks (see page 563).

To enable any citizen to do this, the railroads built in Washington a terminal costing $16,308,277.01 (the one cent on the official figure attests the statistical exactitude of railroads); the Pennsylvania has bored tunnels under Baltimore costing $7,500,000; has spent $25,000,000 for a new station and tracks to facilitate his ride over and around parts of Philadelphia; has dug deep beneath the Hudson River and East River a 7-mile tube and erected a world-famous station in New York, which entire improvement cost $125,000,000.

Of course, these are only a few major items; the complete accounting to make possible this one 226-mile run at high speed, safety, and comfort would have to include costs of trains, locomotives, rights of way, roadbed, and maintenance.

Then the Pennsylvania spent $100,000,000 for the electrification of its line between Washington and New York.

Even had the knowledge been available in John Quincy Adams's time, the entire national debt of 1826 would not have been enough to defray the cost of electrification.

The Pennsylvania likes to talk of "fleets of trains" which give frequent, dependable service. But one must ride on some train, so let us consider the Congressional.

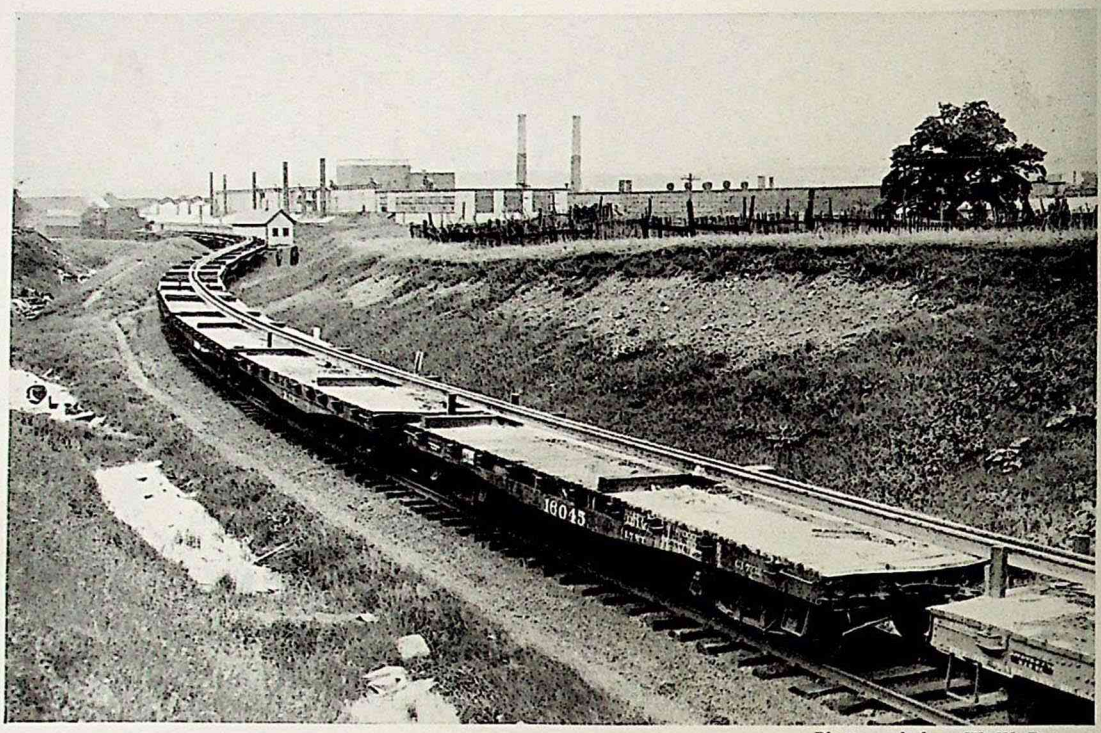
Legislation has been framed on that train, friends meet friends in its dining car and lounge. They have to talk faster now, because the time has been cut to 3 hours and 35 minutes; soon it will be 3½ hours.

The power already is there, in its mammoth electric engines. Increasing speed



FREIGHT TRACKS PIERCE BUT NEVER JAR THE BELL TELEPHONE LABORATORIES

Piles sunk in soft mud support the building in New York City, but the tracks rest on concrete piers that go down to bedrock, 30 or 40 feet deeper. Columns supporting the tracks also rest on pads of lead and asbestos. The elevated structure forms the ceiling of one floor of the building, but is not connected directly to the walls. A flange on the track structure is dipped into a trough containing heavy oil. This provides a weather-tight closure without any solid contact between tracks and building.



Photograph from W. W. Bates

NO LONGER CAN YOU ALWAYS COUNT THE CLICKS OF RAIL JOINTS AND TELL TRAIN SPEED

Forty-two flatcars start from Schenectady with a 1,560-foot continuous rail to be placed on the Delaware and Hudson lines. After unloading, it will be welded to similar lengths to make mile-long sections of track. Elimination of joints smooths rides for passengers, reduces maintenance of tracks and trains, and does away with bonding for signal circuits.

waits on the work of further banking its tracks, like the automobile speedway at Indianapolis. One rail may be six inches higher than the other along the arcs of its broad curves; this rise must begin a mile or so back of the curve.

Its electric locomotive, one of 58 of the new GG-I type, equals the weight of 164 Ford V8 Sedans, and if it should stand on its hind end its bulbous nose would rise higher than a 7-story building.

It rides on 12 driving wheels and 8 more wheels on the other trucks, 20 in all; and a 152-pound track (152 pounds to the yard), heaviest yet made, is being laid to withstand that load and speed.

Science again outstrips mythology in the person of a modest engineering Jove who, from a Philadelphia control room, regulates the flow of electricity along this electrified route (page 550).

From seven power stations flow 132,000 volts to transmission lines. Every ten miles there is a station that steps down that voltage to 12,000 for the trolleys that make contact with the pantographs of the engines. A transformer in the engines cuts down the voltage to 1,400 and the engineer regulates that power by a master controller operated by only 32 volts.

Riding comfortably through the Baltimore tunnels, the engineer recalled how engine crews used to provide themselves with buckets of water and sponges to protect their lungs from the fumes of smoke and gases of steam-engine days.

The aforementioned crack trains illustrate, but by no means complete, the picture of new-type passenger travel.

"RUBBER HEELS" ON THE ROYAL BLUE

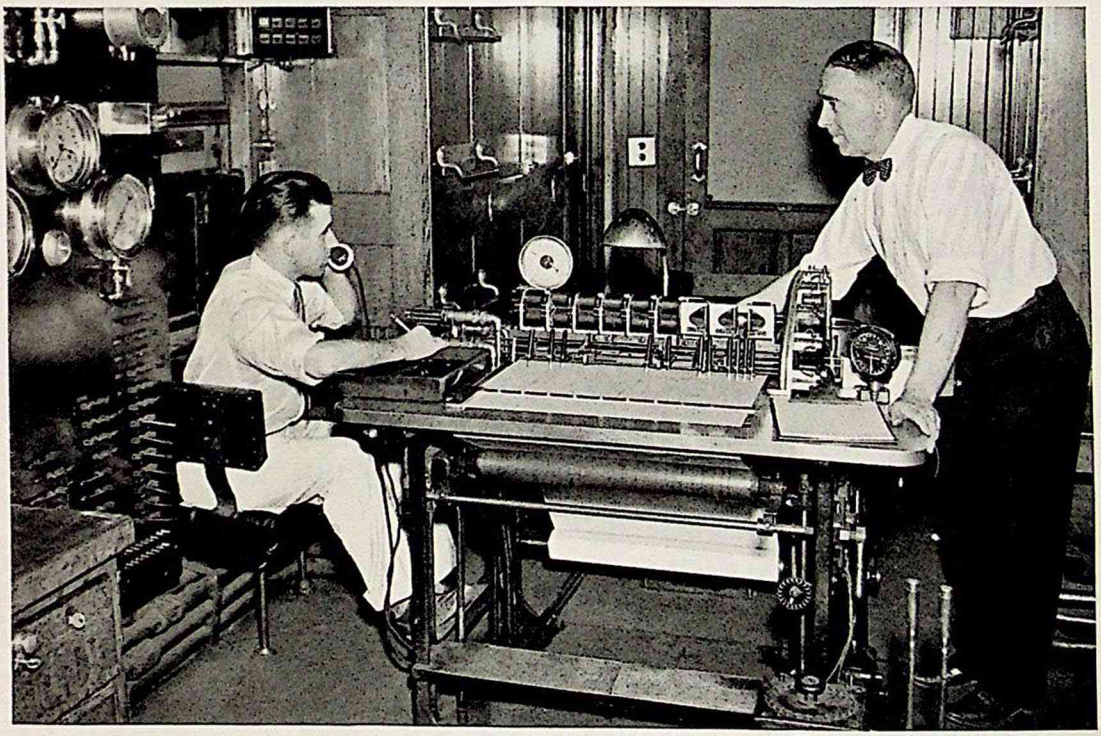
On the Baltimore and Ohio's Royal Blue, twin of the Alton's Abraham Lincoln, one may sit at a lunch counter for a hasty snack (page 580), eat in a luxurious diner, read in a modernistic lounge car, or watch the landscape go by from a glass-inclosed observation car with no rear platform to obstruct the view.

The veteran president of the B. and O.



HERE IS ONE WAY THE RAILROADS SAVE MONEY

This skilled "burner" with an acetylene torch attacks a pile of discarded equipment in the Pennsylvania's reclamation yards at Conway, near Pittsburgh (page 576). Some parts will be repaired and used again, others will be assorted and sold as scrap.



Photographs by J. Baylor Roberts

"STOP. START. SPEED UP. PUT ON YOUR BRAKES"

There is no guesswork now when a railroad buys a locomotive. A dynamometer car attached to a train puts new engines through all their paces, and magnetically operated instruments record performance on such a table as this on a Norfolk and Western testing car. These instruments chart time, speed, coal fired, pull on grades, air-pump strokes, and many other operations (page 578).



Photograph by J. Baylor Roberts

A TEEMING CITY WITHIN A CITY

Skyscraper office buildings and hotels tower above, while stately Park Avenue and crosstown streets traverse the "platform" that spreads 25 blocks north of Grand Central Terminal. This platform rests on piers and columns between the tracks below, where some 600 trains arrive and depart daily (see page 580). In this 48-acre area over the tracks 140,000 people live or work. Around the station, left to right, are the Yale Club, the New York Central Building, a corner of the Waldorf-Astoria Hotel, the Graybar Building, and Hotel Commodore. All these, and others, are connected by underground passages with the station.

dryly remarked that "All this talk was going around about riding on rubber, so we cushioned the Royal Blue with 106 pieces of rubber."

Asked about building new locomotives, he replied with a metaphor of the maple sugar belt, "No, this year we are just sugaring off some of the old ones.

"As you go out," he concluded, "don't forget to look at the sign by the door. It means you, too. Then read this card."

The sign said "Suggestions always are in order."

The card was a typed memorandum which told with Coolidgelike brevity the story of the esprit de corps that road has built up among its employees and its president, who once was a locomotive engineer. It was headed "Summary of Suggestions Received and Discussed at Cooperative Committee Meetings, Jan. 1925 to date." It tabulated: "Number meetings held, 1,113. Suggestions rec'd and discussed, 8,432. Suggestions adopted 5,718. Dropped, considered impractical, 1,909."

The remainder still are pending.

CHINA, RECIPES, AND WHAT TO WEAR

An important B. and O. official is its Engineer of Service—a woman who originally was a bridge builder. Her only "office" is aboard trains; her duty is to keep riding, on her own and other lines, and make suggestions.

Now the road has women passenger agents. They join women's clubs and handle women's conventions. They answer questions no mere man could solve: "What shall I wear now in Florida?"—"How can I arrange for proper feeding of my children on the way to Chicago?"

The Northern Pacific's North Coast Limited and the Great Northern's Empire Builder carry on the steam tradition on their long hauls. The Boston and Maine, with its Flying Yankee, and the New York, New Haven and Hartford, with its Comet, are demonstrating the Diesel-drawn, streamline principle in New England. The Rebel is doing the same in the South on the Gulf, Mobile and Northern.

Ultramodern in its streamlining, its movable furniture and costly fabrics, its "electric eye" operating the dining car door, and its floodlighted engine as it speeds through the night, is the New York Central's Mercury (see page 588).

When one rides the new, luxurious trains of a score of railroads, making the highest schedule speed yet attained, it is not hard to believe that some of them cost a million dollars or more.

Does it pay?

The answers are affirmative, but the reasons are different, in the East and in the West.

"Our average passenger haul is 391 miles, as compared with 61 miles on a large eastern road, or 37 miles on one of the Middle West roads," said an official of the Union Pacific. "We can afford to go after passengers, as does a steamship company."

"Our tracks from New York to Philadelphia are the busiest in the world," said an official of the Pennsylvania. "The whole New York-Washington route is highly congested. Speeding up trains, running more trains and longer trains, is the equivalent of building more tracks. It cost less to electrify than to buy expensive rights of way and increase trackage."

In all areas it must be considered that a railroad cannot expand or contract its passenger service proportionately to the patronage. Scheduled trains must run, the mail must go through, and whether they run full or half empty may be the difference between profit and loss on the operation.

Ten years ago one ate lobster in Baltimore or Washington with some trepidation; fresh berries and melons from Maryland and Georgia might be wilted by the time they reached Buffalo, Pittsburgh, and other inland cities.

Now a train loads lobsters from the boats at Boston's wharves into special tank cars and delivers them to Philadelphia, Baltimore, and Washington next morning (page 579). Refrigerated freight trains speed nightly from Baltimore and Washington with fruit, oysters, and vegetables over a 450-mile radius and more to the north and west.

At Altoona I saw them building a new type of car, with aerated tanks, to haul fresh fish from the Great Lakes to Philadelphia.

FREIGHT, AND YOUR DINNER TABLE

This introduces the portentous question of freight, which is considerably more important to the railroads, also to the citizen, than passenger travel.

The new fast passenger trains are the most spectacular advances in railroading; the faster freights, and the improvement in handling freight shipments, are far more fundamental.

If all the railroad trackage in the United States were laid down in a vast continental gridiron, like the streets of Philadelphia or the State highways of Indiana, each line would be only 14.29 miles from the other. Nobody could live more than 7.15 miles from a railroad.

That simple fact was all-important in the population spread of our country.

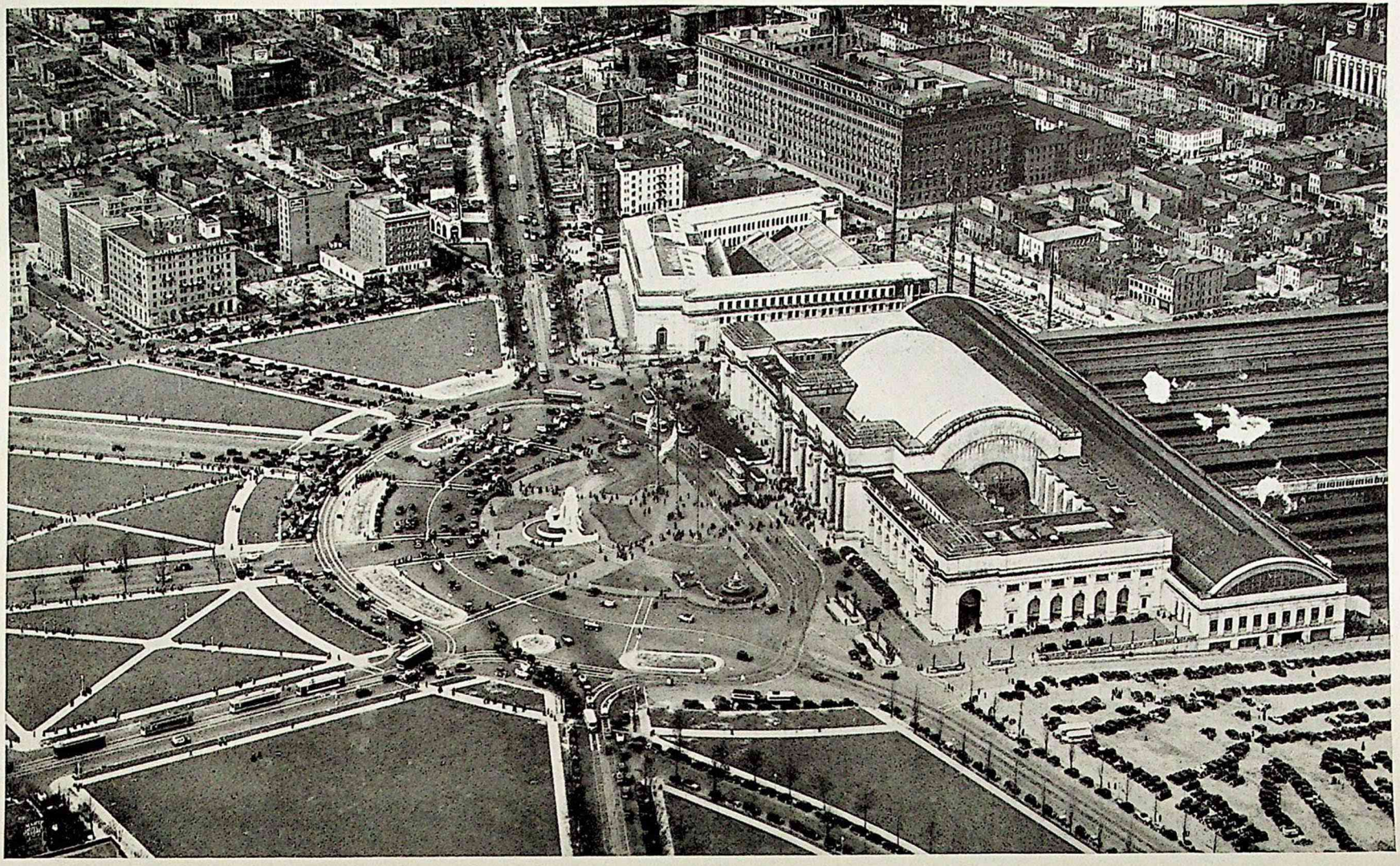
Never before in the history of the world, or anywhere else in the world today, has been developed such an extensive network of rail transportation.

Everywhere else, except in a western fraction of Europe, dense populations cluster along river courses—along the Yangtze, the Nile, the Ganges today, as they have done for thousands of years; or they settle near the sea, as they did on the peninsulas we now call Greece, Italy, Spain, Denmark, and the islands of Great Britain and Japan.

In the vast expanse of the United States are populated places many miles from navigable water. Railroads peopled and still sustain some areas which otherwise might be as thinly settled as the fringes of the Sahara or the Gobi.

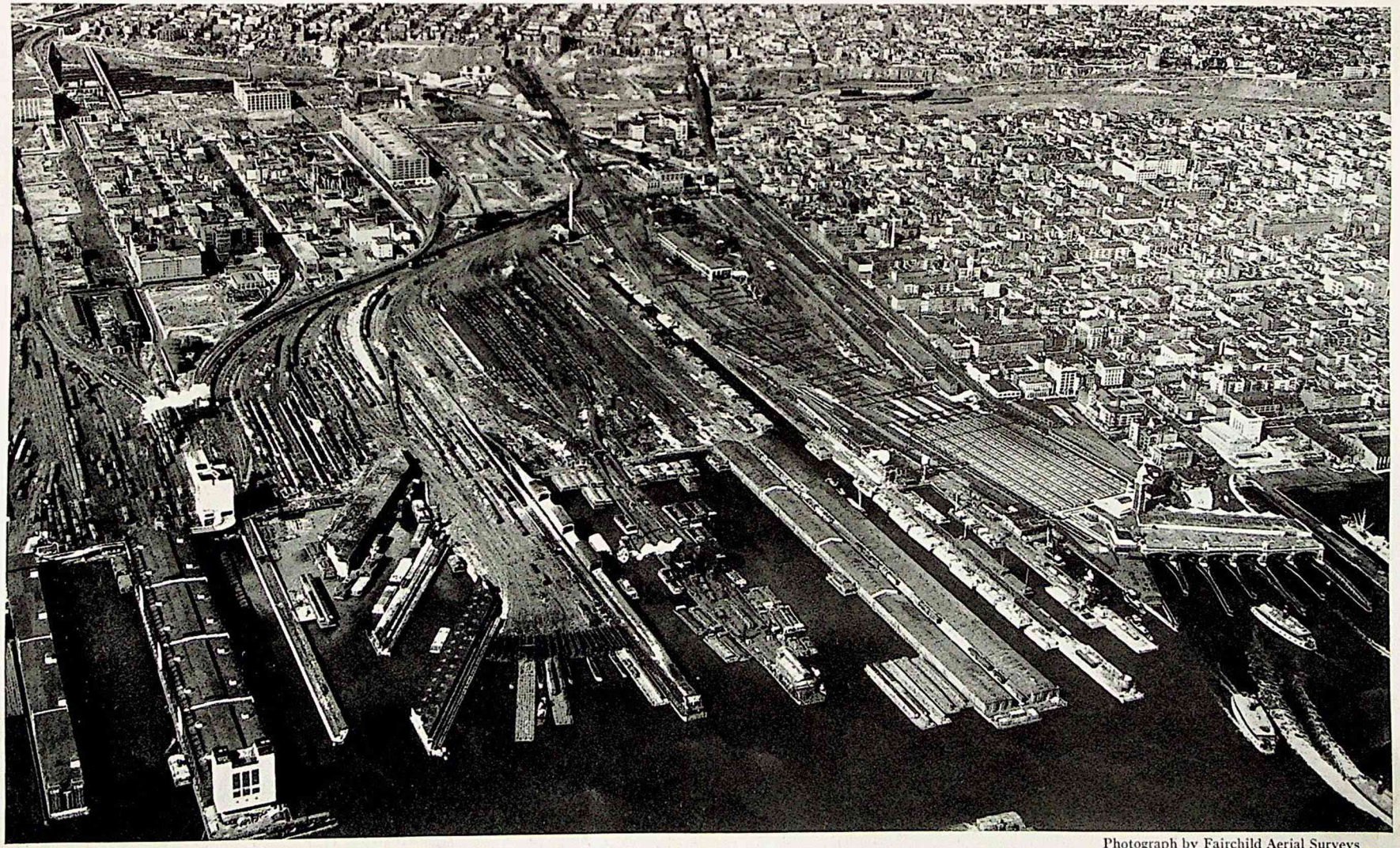
Without railroads, how could there be cities where Denver, Indianapolis, Dallas, Atlanta, Oklahoma City, Dayton, and many other centers now stand?

Even that is not the whole story. London, for example, looks to ships that go



WHERE PRESIDENTS, KINGS, AND INAUGURAL CROWDS ARRIVE

Washington's Union Station, facing the United States Capitol, has a State Suite, which serves as a waiting room for the President and as reception hall for monarchs and other dignitaries. Into its concourse, nearly as large as those of the Grand Central and Pennsylvania Stations in New York City combined, could crowd the entire Standing Army of the United States. Adjoining it is the Capital's City Post Office and, beyond that, is the mammoth Government Printing Office, Uncle Sam's publishing house where 65,000 different Federal publications are carried in stock. All-time best seller is one on infant care.



Photograph by Fairchild Aerial Surveys

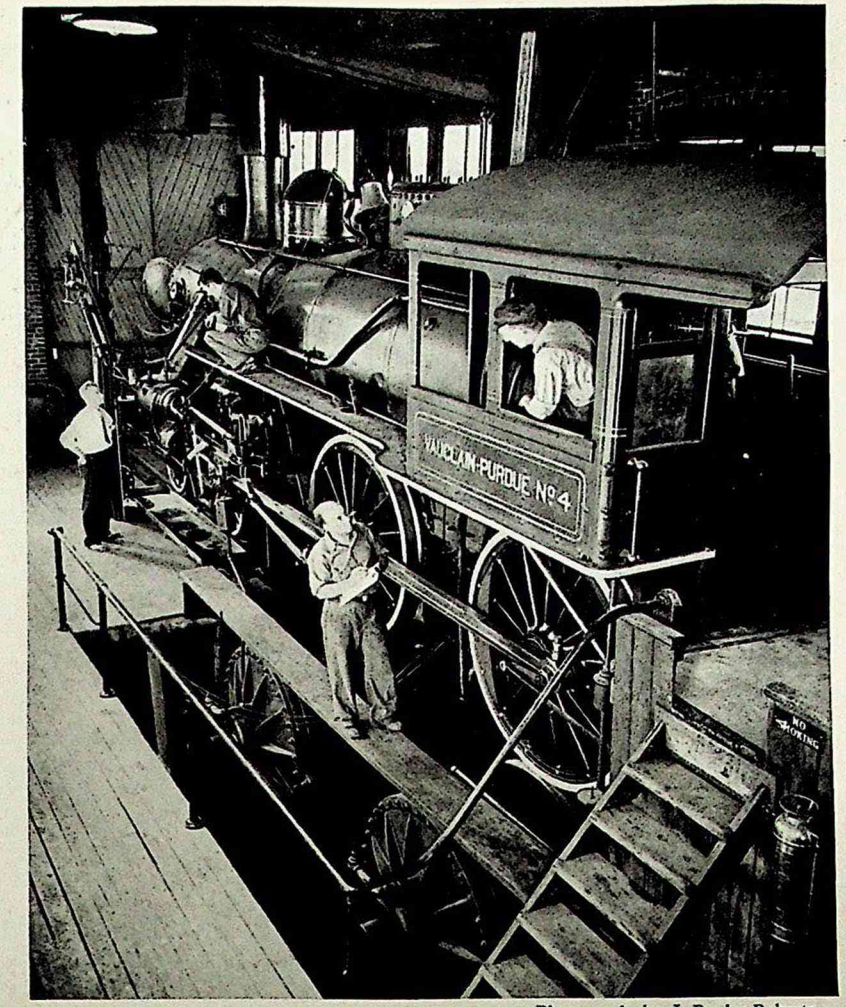
FERRIES, CAR FLOATS, OCEAN LINERS, TUNNELS BENEATH THE RIVER BED, APPROACH A TRAFFIC HONEYCOMB

This cluttered portion of the Jersey City freight yards and Hoboken Terminal of the Lackawanna Railroad is opposite the Canal Street section of Manhattan. To the right is the Ferry Station. The Erie Railroad's projecting pier at the left is used by the Dollar Steamship Lines. To the extreme left are the Erie's Jersey City yards and beyond those tracks is the entrance plaza of the Holland Tunnel. The Erie is a major carrier of California citrus fruits (page 572).



AN "X RAY ON WHEELS" DETECTS "RAIL CANCER"

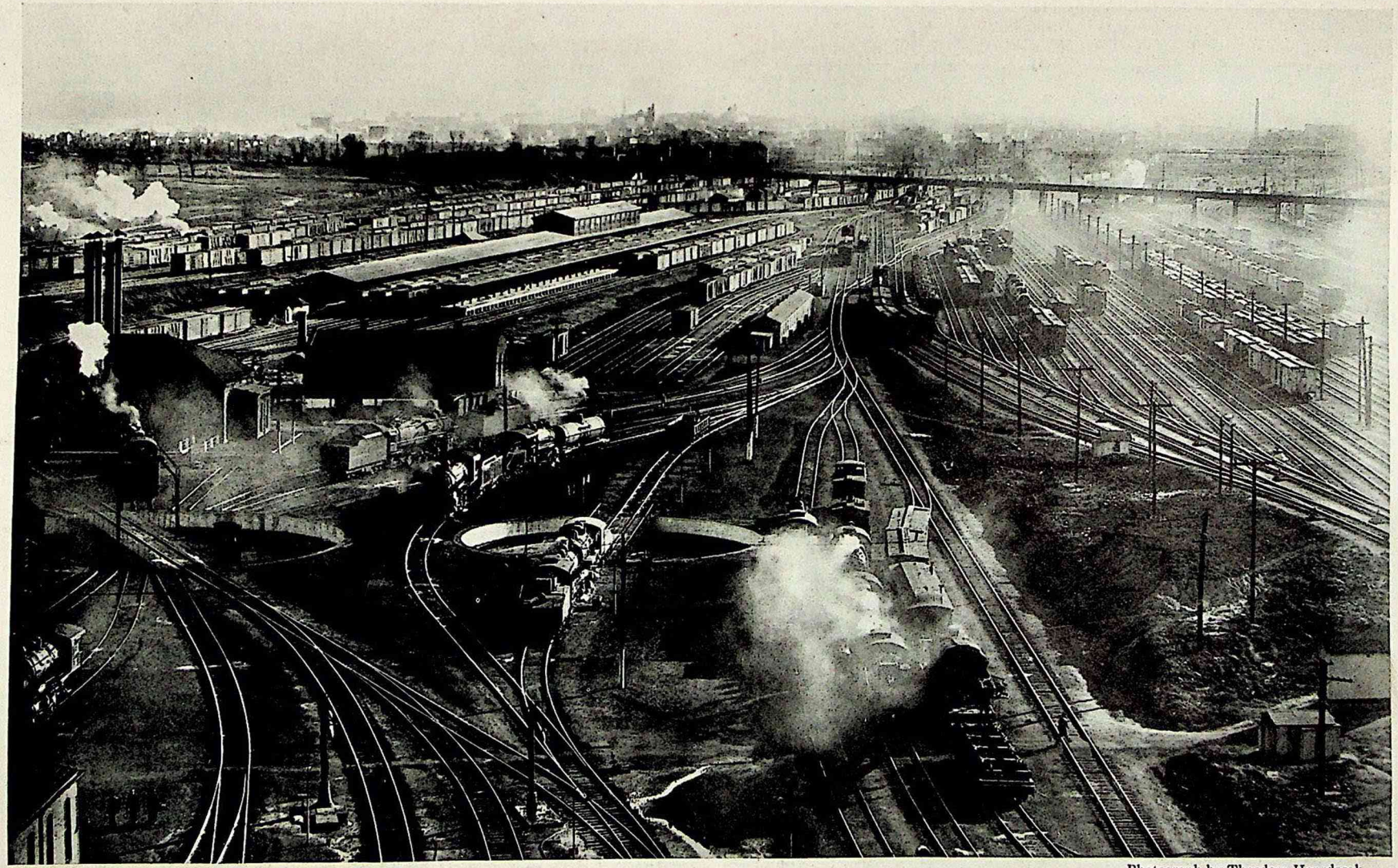
Rails develop internal fissures invisible to the inspector's eye. In past years these were frequent causes of derailment. Now railroads employ Sperry detector cars to check these defects. While the car runs, brushes contact the rails and record imperfections by electrical impulses. These impulses are amplified to operate the pen which here is marking the record tape, and also to spray white paint on the rail at the defective spot.



Photograph by J. Baylor Roberts

PULLING AN IMAGINARY LOAD THAT GOES NOWHERE

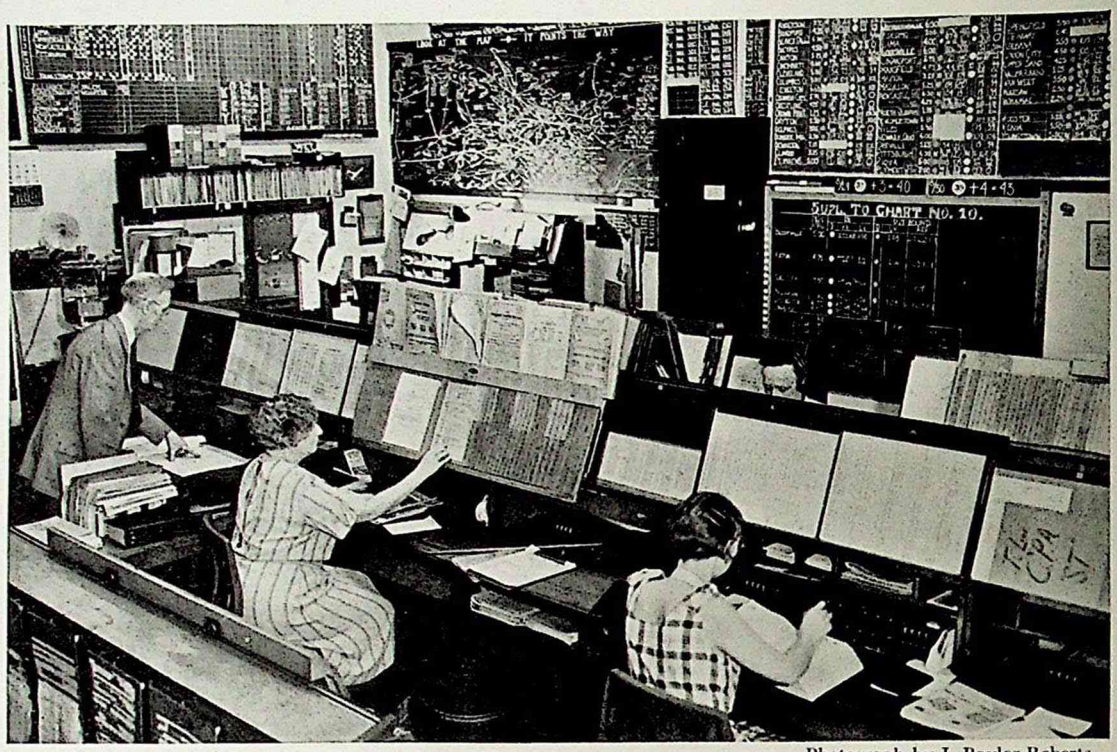
This test-plant locomotive at Purdue University is "running" on revolving wheels, visible below, and the "pull" is controlled by the large, low wheels beneath the platform where the man stands. Purdue was a pioneer in establishing a locomotive testing plant and here seniors and graduate students of railway engineering problems do laboratory work. Forty years ago the University first experimented with wind resistance and streamlining.



Photograph by Theodore Horydczak

CHOKE THIS BOTTLENECK AND CITIES NORTH OF WASHINGTON WOULD GO ON SHORT RATIONS OF FRUITS AND VEGETABLES

Potomac Yards, at Alexandria, Virginia, form the funnel of Atlantic seaboard rail freight traffic. There are 88 miles of tracks in this area—tracks for receiving, for classifying, and for distributing freight cars in the north-south movement of five railroads. Humps, retarders, and inspection pits (page 576) facilitate the distribution of the cars into remade trains. In the busy perishable season more than 4,000 cars are handled here every 24 hours (page 563).



Photograph by J. Baylor Roberts

THERE ARE 50 FEET OF "TRACK" IN THIS INFORMATION BUREAU

The head of the Chicago Union Station's question office also is an inventor. Files mounted on roller-bearing wheels run on miniature rails. Revolving tables, wastebaskets with tariff schedules on their sides, "flip-flop" files that can be used by clerks sitting opposite each other, are other of his devices for speeding up the right answers. Maps, charts, and blackboards operate by pulleys, and red, yellow, and white chalk further clarify intricate schedules. One file shows 3,000 train and sleeping-car fares from Chicago to points in every State and into Canada.

down to the sea to bring her millions food, raw materials and supplies, and to carry her products to world markets.

But New York, Los Angeles, Chicago, San Francisco, and other American ports depend largely upon railroads to haul from our own interior their daily bread and eggs, fruits, spinach, timber and coal, and to distribute inland the bulk of their manufactured goods.

Western Europe connects its deep sea indentations and interlocks its rivers with canals. In the United States the distances were too long, the mountains too high, to get far with building canals.

THE RACE OF RAIL AND CANAL

The race of rail and canal began even. The Ohio River was the goal. On the same day of the same year, 108 years ago, work was started on the Chesapeake and Ohio Canal, from Georgetown, D. C. (now a part of Washington), and on the Baltimore and Ohio Railroad, in Baltimore.

On July 4, 1828, just 52 years after he had affixed his bold signature to the Declaration of Independence, Charles Carroll, of Carrollton, Maryland, then only survivor of the Signers, laid the first stone of the new railroad.

"Just a crazy dream," said most people.

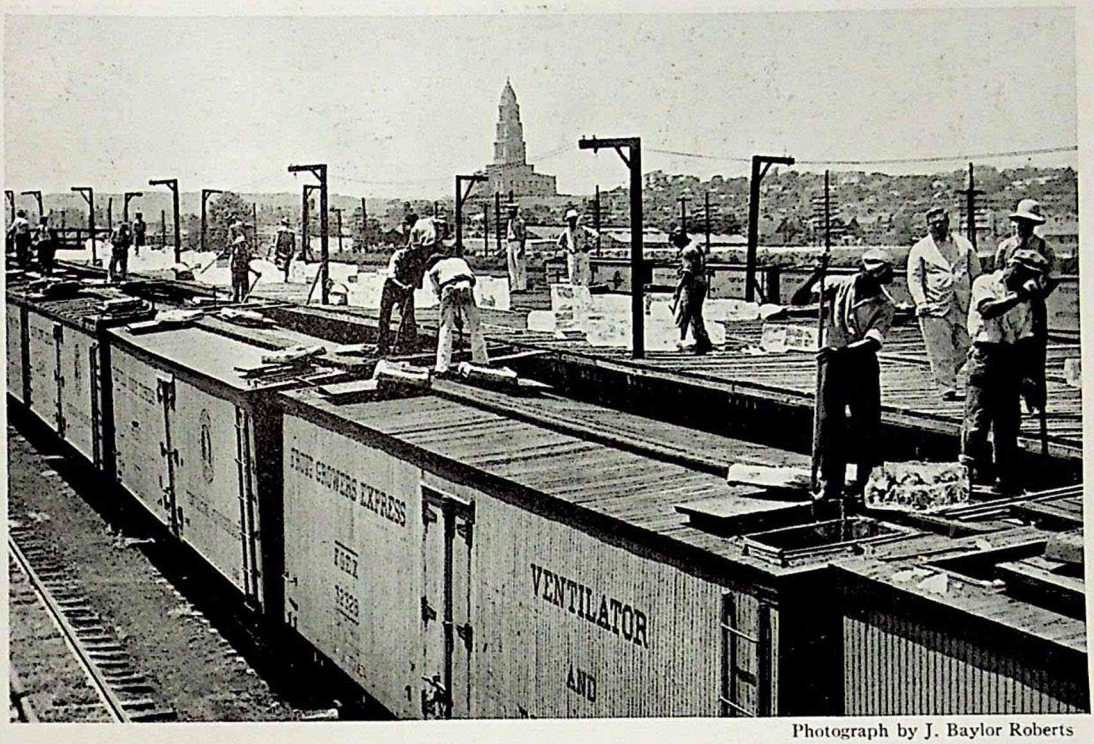
Certainly no one dreamed that railroads were to become to the United States what ships are to the British Empire, coolies to China, caravans to the Near East: the essential, but swifter and cheaper transport, to feed, clothe, and supply the people.

A YARD 13 MILES LONG

The New York Central System handles more freight than all the railways of Great Britain and France.

If you would see how an American city is fed and supplied, visit that road's West Side Freight Yard in New York.

The "yard" is 13 miles long, extending from Spuyten Duyvil to lower Manhattan. If all its tracks and sidings were laid in a single line, you could ride on it from New York to Trenton, New Jersey.



Photograph by J. Baylor Roberts

FROM ELEVATED PLATFORMS CARLOADS OF PERISHABLES ARE RE-ICED ON THEIR SWIFT WAY TO CITY TABLES

On one summer day it required 1,200 tons of ice for fruits and vegetables in Potomac Yards, near Alexandria, Virginia. Oranges and grapes from Florida, cantaloupes from the Carolinas, apples from Virginia, peaches and watermelons from Georgia—all pass here. Florida also supplies the bulk of lettuce, celery, bean, beet, and pea shipments. Upon the summit of Arlington Ridge, overlooking the Potomac, is the George Washington Masonic National Memorial, visible from many parts of Washington, D. C. (page 561).

For fifteen blocks north of 60th Street children romp and adults stroll in 32 acres of park rising from the banks of the Hudson over its tracks.

More recent improvements at West Side Yard involved the removal of 640 buildings and the purchase of some 350 separate parcels of land. The city relocated two schools, and the railroad had to build a new church on another site for one congregation.

South of 30th Street the tracks go "elevated." They take to viaducts and then spread out to enter the second floor of St. John's Park Terminal, new freight warehouse that covers three large city blocks. There are 21,000 tons of steel in that structure.

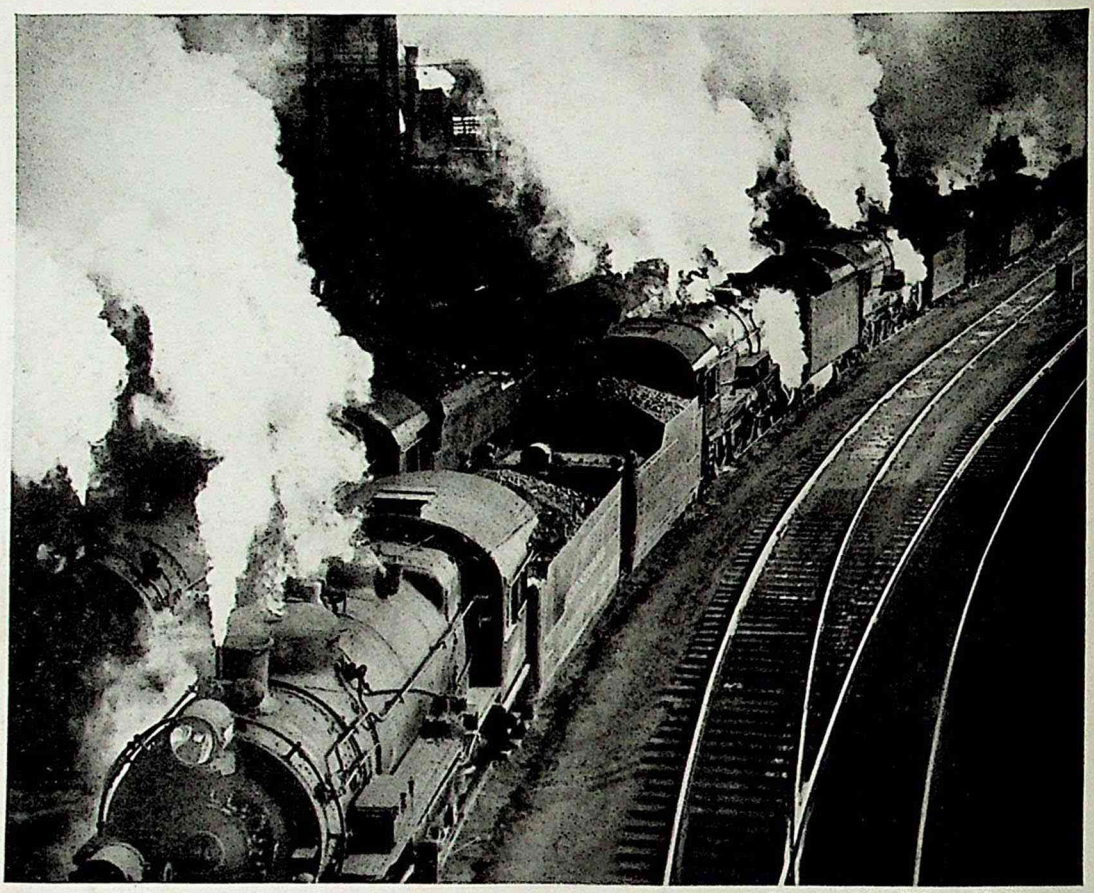
Trailer trucks cling like leeches in long rows to the undercover platforms of the street level, resting on hind wheels and a support until a tractor hooks under their forward end and hauls them away.

More than 150 trucks can load and unload there at a time, and by the tractor method each becomes a miniature warehouse, thus avoiding the tying up of motive power until the vehicle is ready to move.

On an average, not overbusy day, through this one station passed 72 tons of butter, 16 tons of cheese, 45 tons of eggs, 20 tons of canned goods, and 22 tons of poultry. Hundreds of miscellaneous items, from brooms to newsprint paper, aggregated 592 tons.

FREIGHT SIDING AROMAS A LESSON IN GEOGRAPHY

The West Side tracks weave in and out of huge warehouses, factories, a biscuit bakery, a refrigerating plant, and a stockyard structure. Sidings span busy streets from one unit to another of several plants. Along this 13-mile yard department store warehouses, manufacturers, automobile assembly plants—all have literal "back door delivery" from car to floor or shelf.



Photograph by William M. Rittase

STEAM UP, TENDERS FILLED, READY TO GO!

Locomotives, serviced at the West Philadelphia enginehouse of the Pennsylvania Railroad, will proceed to Paoli, 19 miles west on the main line, present terminus of the electrified zone.

Other sidings run out to docks and piers. I saw them launching speedboats direct from rail to water, and handling cargoes consigned to Rotterdam, Valparaiso, Singapore, and Canton.

Riding the front platform of a Diesel switching engine, I caught stray whiffs of Florida oranges, Hawaiian pineapples, Brazilian coffee, and vinegar from Wisconsin—two tank cars of vinegar, sire of how many orders of pickled pigs' feet or platters of salad?

Two carloads of ripe tomatoes, and three of head lettuce, track to track, awaited culinary assembly.

Pungent odors of onions there were, too, of a tarred rope shipment, of scented soap, and of fresh fish. Shut your eyes there and your nostrils report the geography of the railroads' amazing distribution of food and goods.

The most odorous, but among the most immaculate, series of sidings are those assigned to poultry cars. They come in by the dozens daily—a hundred and more around Thanksgiving—these cars with their barnyard cackle cargoes, the fowls in trays like filing cabinets behind screen sides. In the center is cabin space for an attendant, the "poultry porter," who serves them food and water in troughs that run alongside the tiers of trays.

"What becomes of the eggs laid en route?"

It was the wrong question. There was intimation that the shippers wink at the attendants' "rake-off" on selling them here and there along the way, perhaps as a tip for a stuffy, uncomfortable job.

Frenzied bidding goes on around these poultry sidings of a morning. Before a single hen or turkey is removed, it must be inspected by a Government agent to see that its crop is not overfull and that it otherwise is in prime condition for a roast or fry.



Photograph by J. Baylor Roberts

SWING HIGH, SWING LOW, BUT DON'T JAR THE CONTENTS!

In the busy Enola Yards, near Harrisburg, Pennsylvania (page 575), are seven tracks over which moves a bridge that carries traveling cranes for transfer of containers. On one busy day this apparatus swung 673 of these huge metal boxes from car to car. The containers effect a major economy in handling shipments of less than carload lots.

Segregated also is another freight yard "spotless town"—that for handling milk. Bulk milk for dairies, chain restaurants, and ice cream makers now may be shipped, like petroleum, in tankers. One type has a 2,100-gallon truck tank, its hind wheels locked to a flat-bottom car, its front resting on supports in transit. When the car arrives, this trailer is swung sidewise on a swivel, a tractor is attached under the front end, and it is hauled away.

Other types have siphons which drain the fluid from their stainless containers.

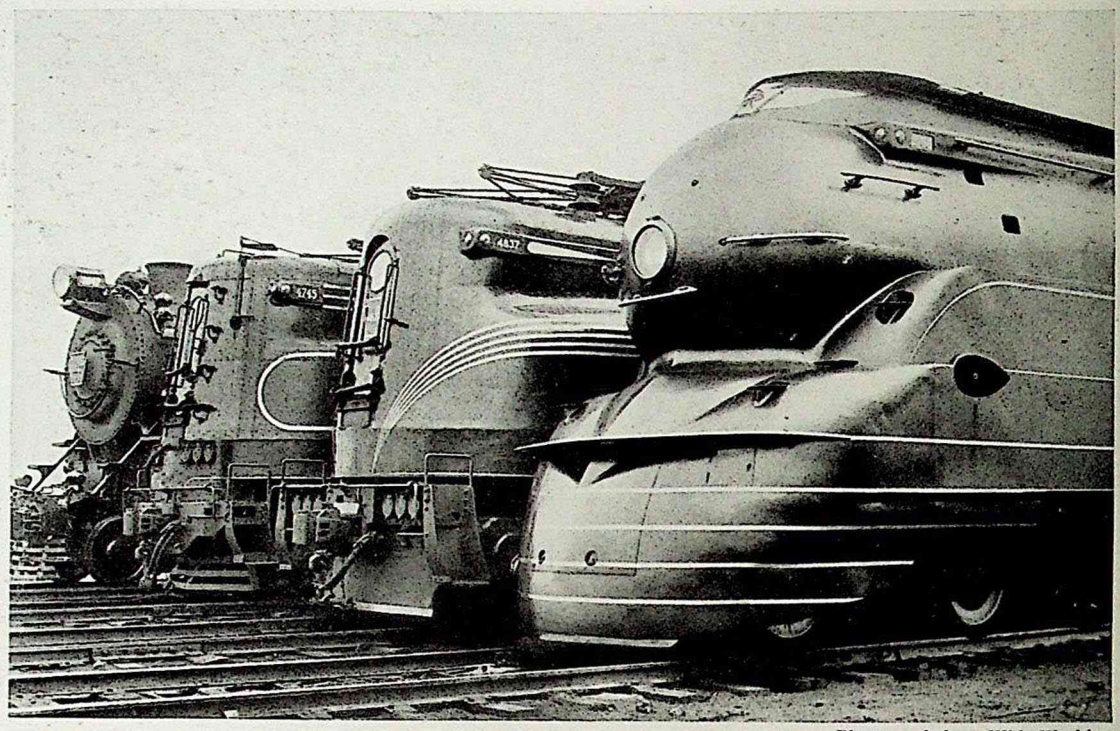
Tracks are cleared, as for a passenger express, when the Merchandiser trains, Twentieth Centuries of the New York Central's 300 scheduled freighters, come or go on their overnight runs between New York and Buffalo. To make the 460 miles in 10½ hours they have to speed 65 miles an hour on some stretches.

Freight cars on such runs now are mounted on passenger-car trucks. Their engines scoop water on the fly from track pans.

Among railroad men you will hear much more about the Merchandisers, the Banana Specials, the Frisco Flash, the Potato Special, or the Blue Streak than you will about the famous passenger trains.

The Speed Witch of the Pennsylvania and New Haven roads plies between Baltimore and Boston in 16 hours. The B. and O. runs its banana train from Baltimore to Cleveland in 14½ hours. The Illinois Central schedules its Panama Dispatch, laden with tropical imports at New Orleans, to Chicago in 41 hours. The Katy Rocket lands Texas grapefruit and persimmons (now a commercial crop) in St. Louis in 34 hours.

Speeding up perishables is only part of



Photograph from Wide World

"THEY HAVEN'T DONE RIGHT BY OUR COWCATCHER"

This is the complaint of a veteran railroad man who laments the evolution of the standard steam locomotive (left) through the successive stages of streamlined electric, heavy-duty streamlined electric, to the rounded prow of the new steam locomotive, on the right. At maximum speed streamlining saves nearly 300 horsepower on these Pennsylvania engines.

the advantage. The merchant profits by carrying smaller stocks, saves on storage, and can give quicker and more flexible service.

Recently a customer entered a Boston store at 4 o'clock to buy a rug. The only one in stock that fitted the color scheme of his room was damaged.

"If you like that rug, I will have a perfect one delivered to your home tomorrow morning," promised the salesman.

"If there's another to be had, tell me where and I'll drive out to get it."

"You will scarcely wish to do that, sir. I will wire our New York warehouse, they will put it on the night freight, and I'll have it out to you by 11 o'clock tomorrow morning."

And he did!

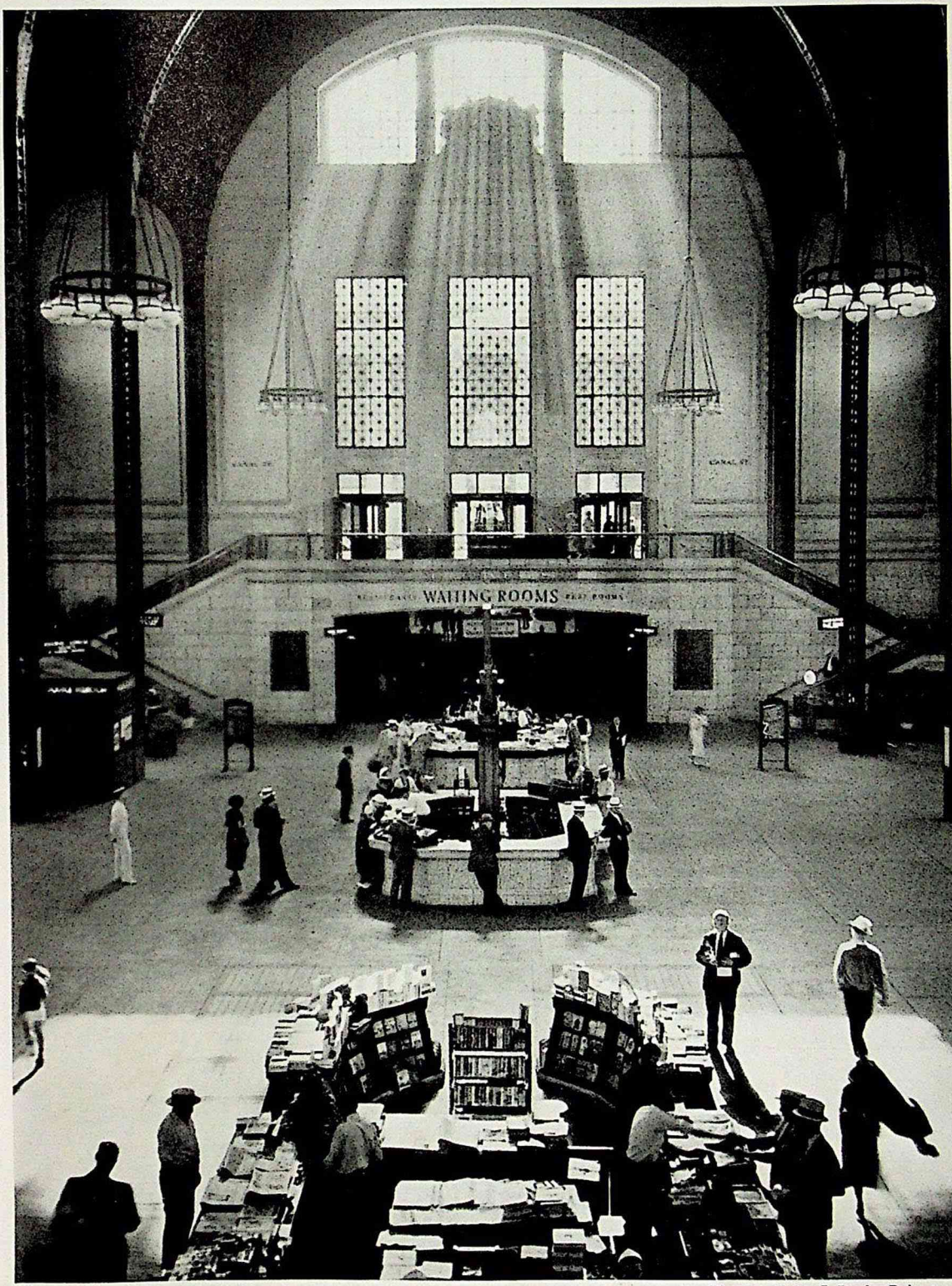
PICKUP AND DELIVERY

A vast extension of faster freight service has been accomplished by collection and delivery. If a peach grower of Georgia, or a hardware manufacturer of New England, a butter and egg shipper of Wisconsin, or a sheep raiser in Utah wishes to ship even a small consignment, he has only to call a freight station. A truck will collect his parcel, another truck will deliver it to consignee.

Carload-lot shippers are known to every freight agent and their business is stable. But in the less than carload lots, the occasional individual consignments, railroads have found a new field for freight expansion. Railroad contracts with trucking companies for performing this service now form no mean item of the latter's business.

To help handle these small shipments the container car was devised (page 565). Five or six huge steel boxes that look like magnified office safes are mounted on flat cars. If an entire consignment is for one shipper, a crane swings it from car to truck, the recipient unpacks the goods and returns the container.

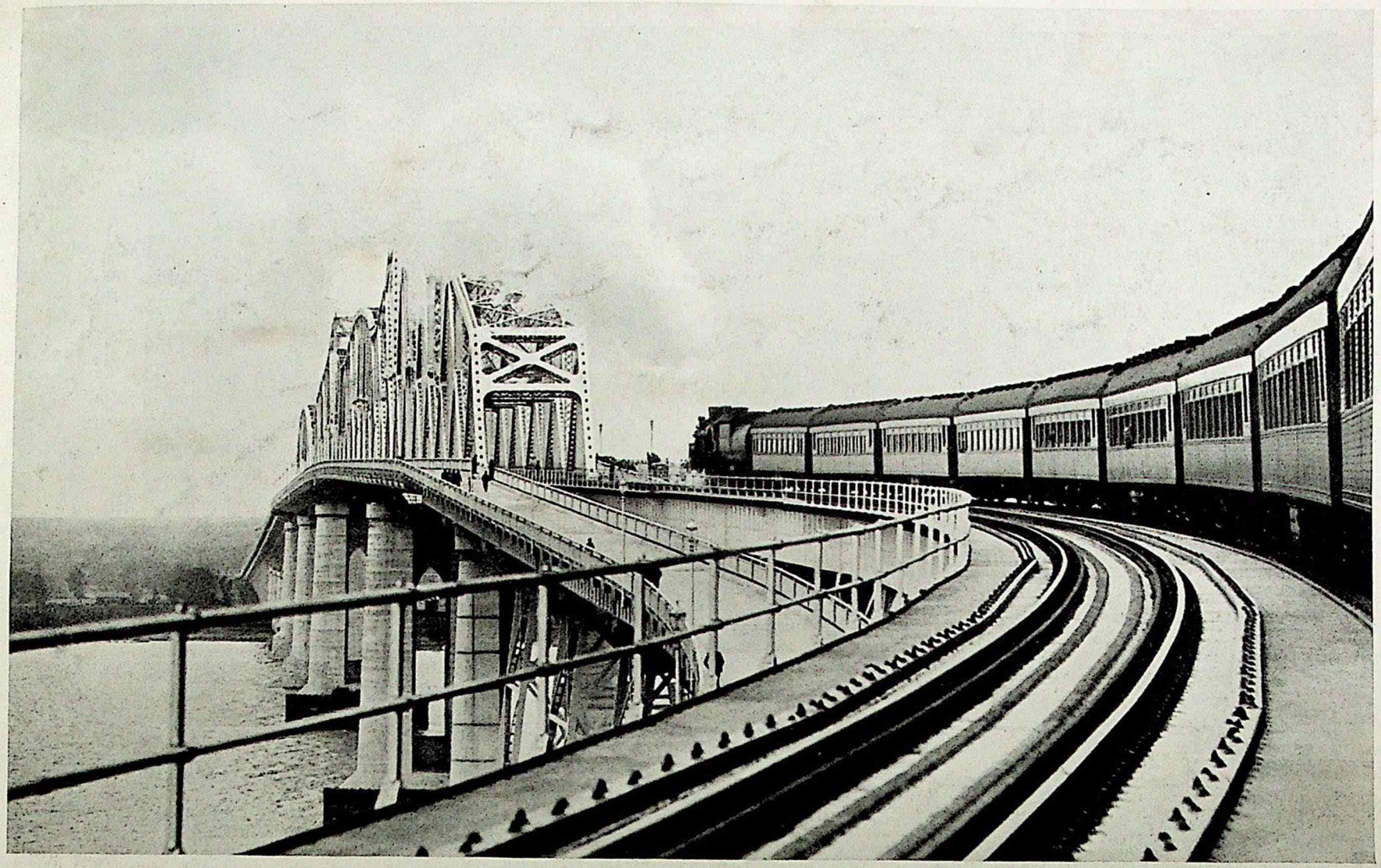
Cattle from the plains, timber from the forests, coal from the mines, fruit from the orchards, fish from the sea, vegetables from gardens everywhere—how does it all get here, one wonders, as he scans the



Photograph by J. Baylor Roberts

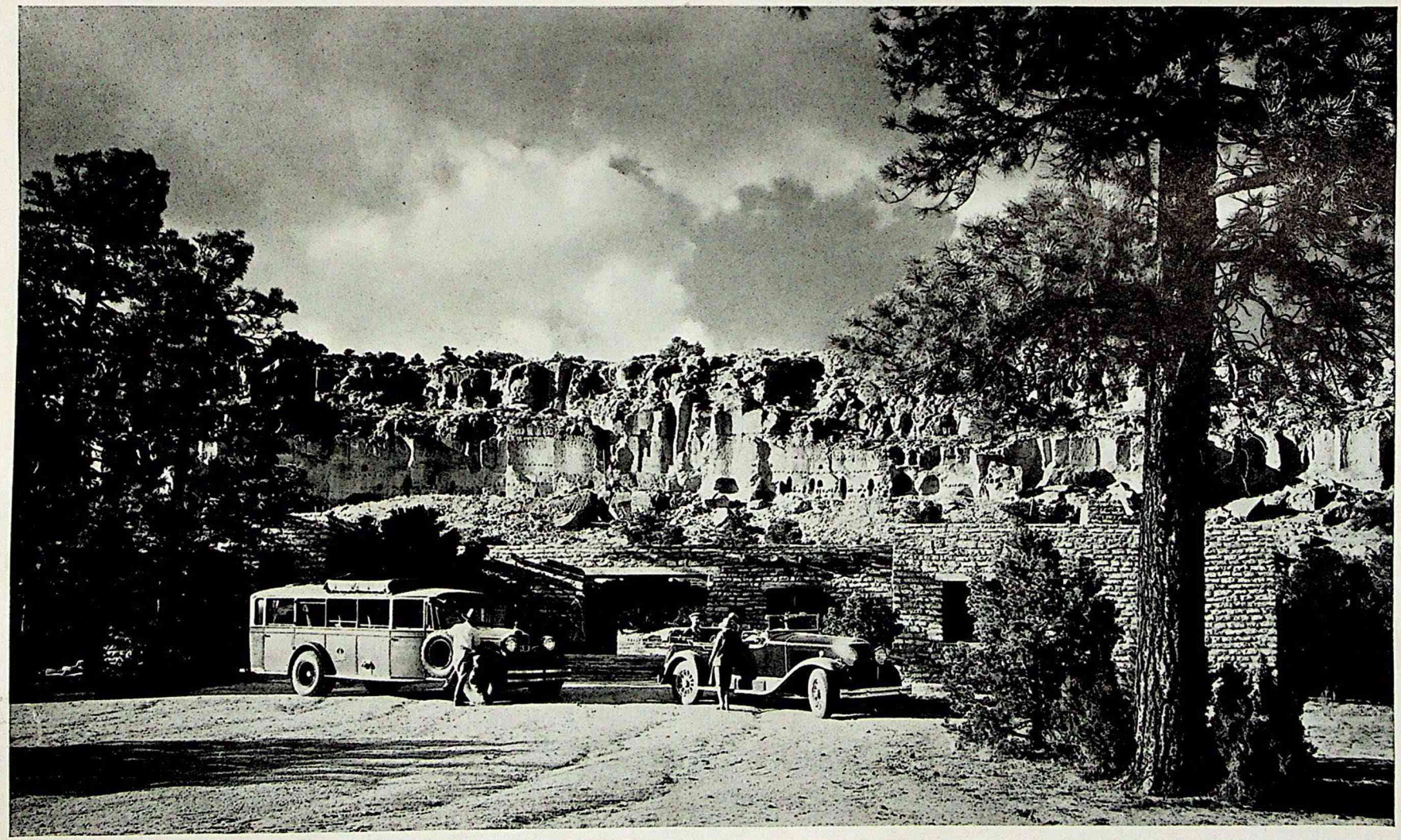
"CAN I CARRY MY CANARY WITH ME ON A DAY COACH?"

It takes 24 people to answer 3,600 questions a day at the information booths and telephone inquiry room of Chicago's Union Station (page 562). Beneath the serene concourse and waiting rooms are electric, carpenter, and machine shops, an art studio, and kitchens that make 200 gallons of ice cream a day, bake 600 to 700 pies each morning, and wash 20,000 dishes every 24 hours. Mostly unseen by passenger eyes some 100,000 mail pouches are handled daily in this station.



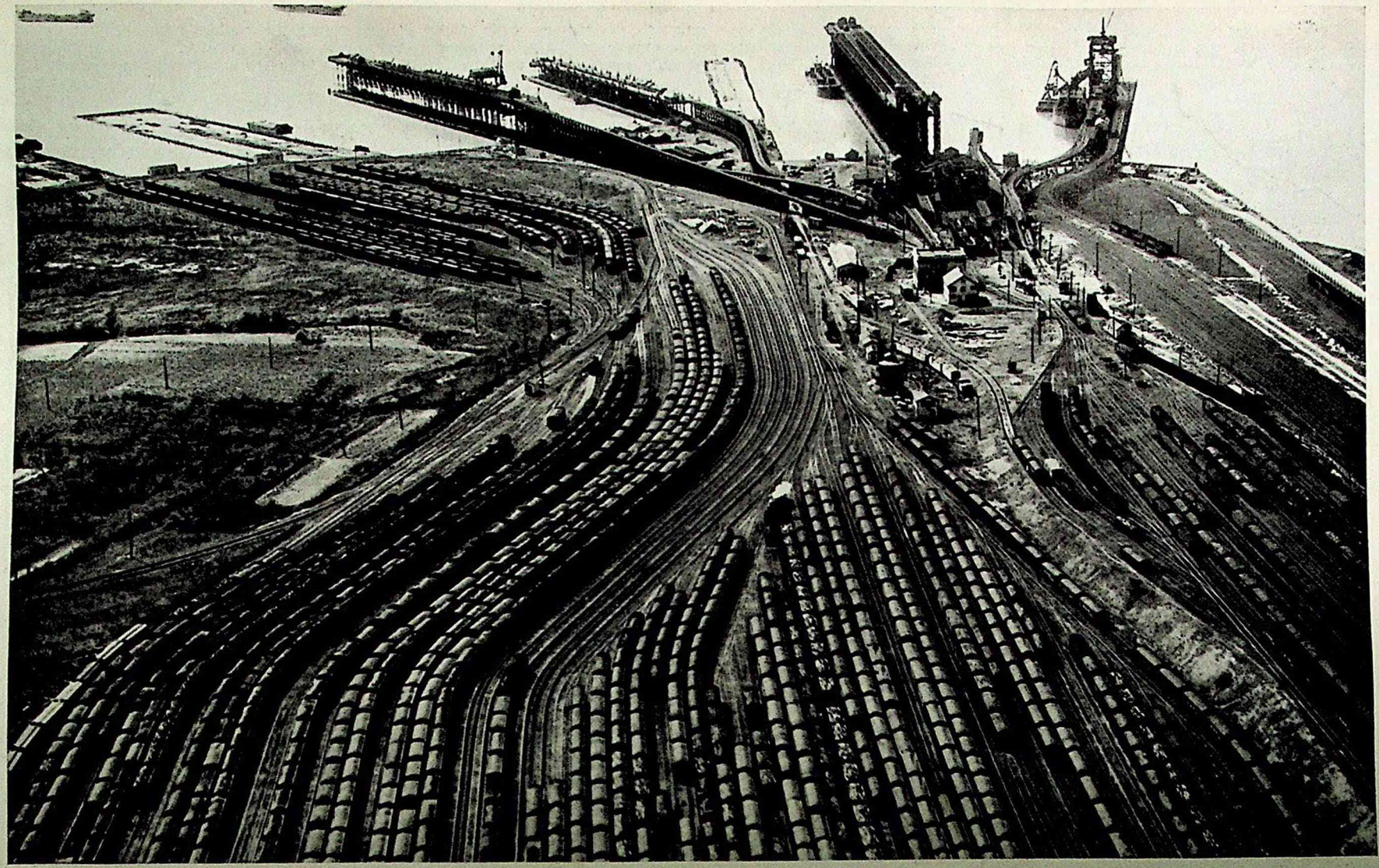
"OLD MAN RIVER" IS CONQUERED AGAIN

A Southern Pacific passenger train is first to cross the new cantilever bridge over the Mississippi River near New Orleans. The entire structure is 4.4 miles long and rises 135 feet above high water. Its central pier from top to bottom of its foundation far below the water is equivalent to the height of a 32-story building.



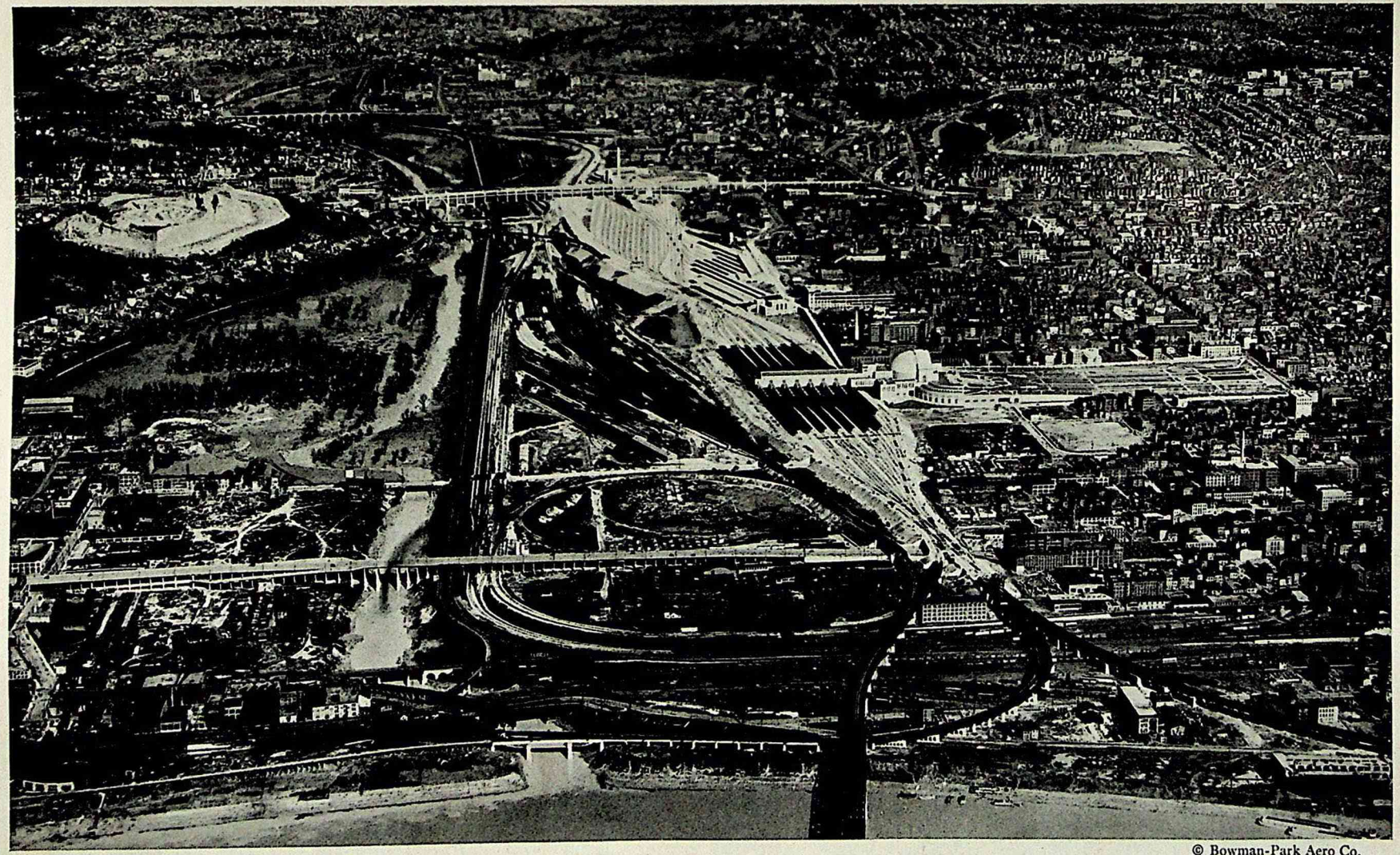
A HOTEL WAS BUILT AND COLLEGE WOMEN TRAINED AS COURIERS FOR THE SANTA FE'S INDIAN DETOURS

Coaches and limousines await passengers who would stop over from one to 30 days to explore the Spanish and Indian country of northern New Mexico. Here, hollowed from soft rock of Puye Cliff, some 35 miles northwest of Santa Fe, are the prehistoric dwellings once occupied by the remote ancestors of the Santa Clara Indians, whose present-day pueblo is only a few miles distant. The resthouse in the foreground is built of stones from the enormous 1,000-room pueblo ruins above.



MYRIAD COAL CARS, LIKE GIANT BEETLES, LINE UP ON NORFOLK PIERS

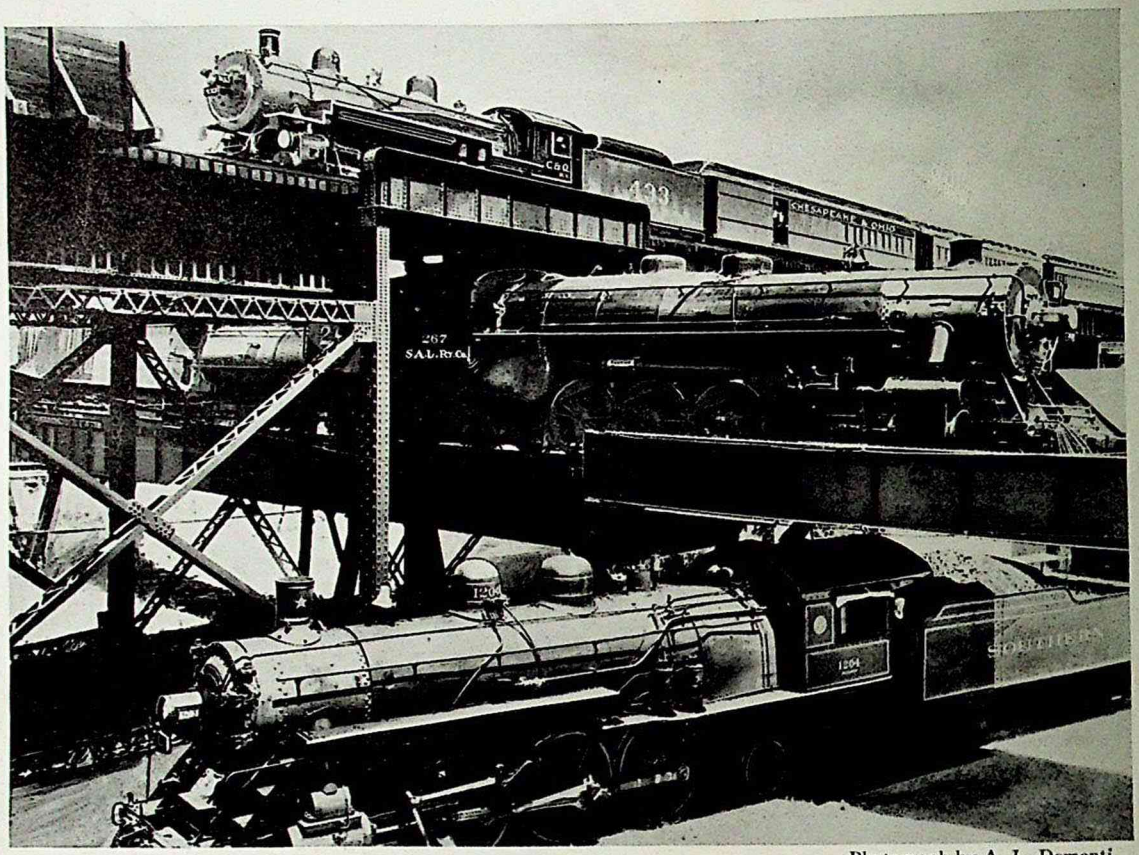
At the right is a new lake-type pier, recently completed at a cost of $1,600,000. This steel robot can transfer 2,000 tons an hour from car to ship, laying down its black cargo so gently that no lumps are broken. The storage yards for the Norfolk and Western's tidewater terminal have a capacity of 5,000 cars.



© Bowman-Park Aero Co.

LONG, LOFTY BRIDGES LEAP ALL GRADE CROSSINGS IN CINCINNATI

Across the Ohio River, in the foreground, and from all other directions converge the viaducts which bear the passenger and freight traffic of seven railroads. In the right center is the half-dome of the monumental Union Terminal, which ranks among the world's finest modern buildings. Artists and students travel far to see its magnificent murals. Beyond either end of the roofed passenger platforms are towers which route through trains over the fanlike spread of station tracks. In front of the Station Plaza is a city park laid out as part of the terminal beautification project.



Photograph by A. L. Dementi

LITERALLY AN AIRLINE FOR THE SEABOARD, ALSO FOR THE CHESAPEAKE AND OHIO

The Southern Railway's ground track here was in use before the Civil War. One of the Seaboard Air Line's mammoth engines travels its main line on the second trestle. The C. and O. train at the top is passing over one of the longest railroad trestles in the world, extending more than 2¾ miles. The triple crossing at Richmond, Virginia, enables these lines to enter Main Street Station.

infinite conglomeration of shipments in the West Side Yard.

THE CHANNEL AND TRIBUTARIES OF RAIL TRAFFIC

The man-made channel for the flow of traffic on the New York Central System has its trunk across the Empire State from Buffalo to Albany.

Its tributaries reach out to Chicago, penetrate Michigan to the north, and touch St. Louis on the south.

Its huge delta has mouths at New York, Boston, Montreal. And the goods that emerge in that delta may originate on the Pacific coast, in the Gulf of Mexico, or in Canada.

Providing the facilities and arranging clockwork schedules to haul hundreds of tons of perishables from the Pacific coast fresh for eastern tables is an epic of railroad teamwork.

The carloads of oranges, pineapples, melons, lettuce, arriving daily in New York on various lines, represent the most amazing food transport in the history of the world. Across the continent they speed for 3,000 miles, guaranteed to arrive the ninth morning from California.

The products are garnered over an area equal to that of New York State, New Jersey, Maine, Vermont, and Rhode Island combined. Pickup trains run as far as 375 miles to collect carload lots for concentration points: Sacramento, Roseville, Bakersfield, San Bernardino, and others.

At last report railroads had invested $182,574,319 in 66,944 refrigerator cars for this business; some $15,000,000 in piers and auction markets in New York City alone; $26,500,000 in icing and re-icing facilities.

The refrigerator car has done more to extend the range of food distribution than

any agent except the "tin can." It means more in the daily life of the individual than all the air-conditioned passenger cars.

Now precooling in plants has given way to precooling within the cars. This is accomplished by placing ice and salt in tanks on the cars and forcing air circulation by portable fans. After precooling the fans are removed, the ice and salt renewed, and they are replaced as needed along the 3,000-mile run (page 563).

THE RAILROADS TAKE TO SEA

Because Manhattan is an island, the twelve railroads serving New York City must take to the sea with most of their freight (page 540).

Even the New York Central, which has the only direct rail freight connection with lower Manhattan, maintains a fleet of harbor craft for handling import and export goods, and for coastwise traffic.

All in all, the railroads' fleets number 150 tugs, more than 1,000 lighters and barges, 323 car floats, and various other vessels, representing an investment of $50,000,000 and employing 3,400 men.

Aboard the tug flagship of the Pennsylvania Railroad's harbor fleet I heard the Commodore, or marine superintendent, giving orders to shore stations and to various vessels of his 258 craft by wireless telephone.

A railroad committee worked with the Bell Telephone Company experts for many months to develop this communication system for the railway's floating units.

Carload lots ride the 3-rail floats, some of them carrying 22 cars, and a tug between propels two of the floats at a time. The car floats move on schedule, just as the trains do. At terminals a towerman, operating an array of levers, levels the tracks and a jackknife apron clamps land rail to float rail.

In a single recent month 76,099 freight cars were floated between rail terminals across the waters that surround Manhattan and Long Island. As many as 2,075 cars have been floated from Greenville to Bay Ridge in 24 hours.

Moreover, in the same month more than 83,000 freight cars were floated to pier stations to unload for delivery or transfer in New York City.

At the pier stations floats anchor, and cars aboard are loaded or unloaded as they would be at any freight station. One of these piers has 12 acres of floor space and 200 cars can be anchored at one time.

Over the rails came to New York last year 5,556 carloads of apples, 3,882 of cabbages, 3,416 of peaches, 7,531 of oranges, and 15,258 of "hardware," the trainmen's parlance for potatoes. It took 350 cars to bring in the artichokes the city consumed. If you prefer your statistics in tons, multiply such items as 355 carloads of snap beans by 12, but double the multiple for heavier vegetables and fruits.

Then there is the lighterage service. That is the pickup and delivery of the harbor. However, the run is between ship and pier, rather than from farm or factory to station.

While the car floats run on schedule, the lighters engaged in collection and delivery do not. They must be directed by a single supervisor, a sort of marine train dispatcher, and that is where the radiotelephone helps.

In the lighterage service are huge derrick barges that can swing upwards of 65 tons of machinery or structural steel from their decks to steamer holds, swift little power lighters for express service, and mammoth, tug-drawn barges for grain, timber, coal.

There are 140 refrigerator barges, to protect livestock, fresh meats and other perishables from spoiling in hot weather, also provided with stoves in winter to keep them from freezing.

MAKING OUT 18,000 BILLS A DAY

"The bookkeeping for all this freight must be an auditor's nightmare," I suggested.

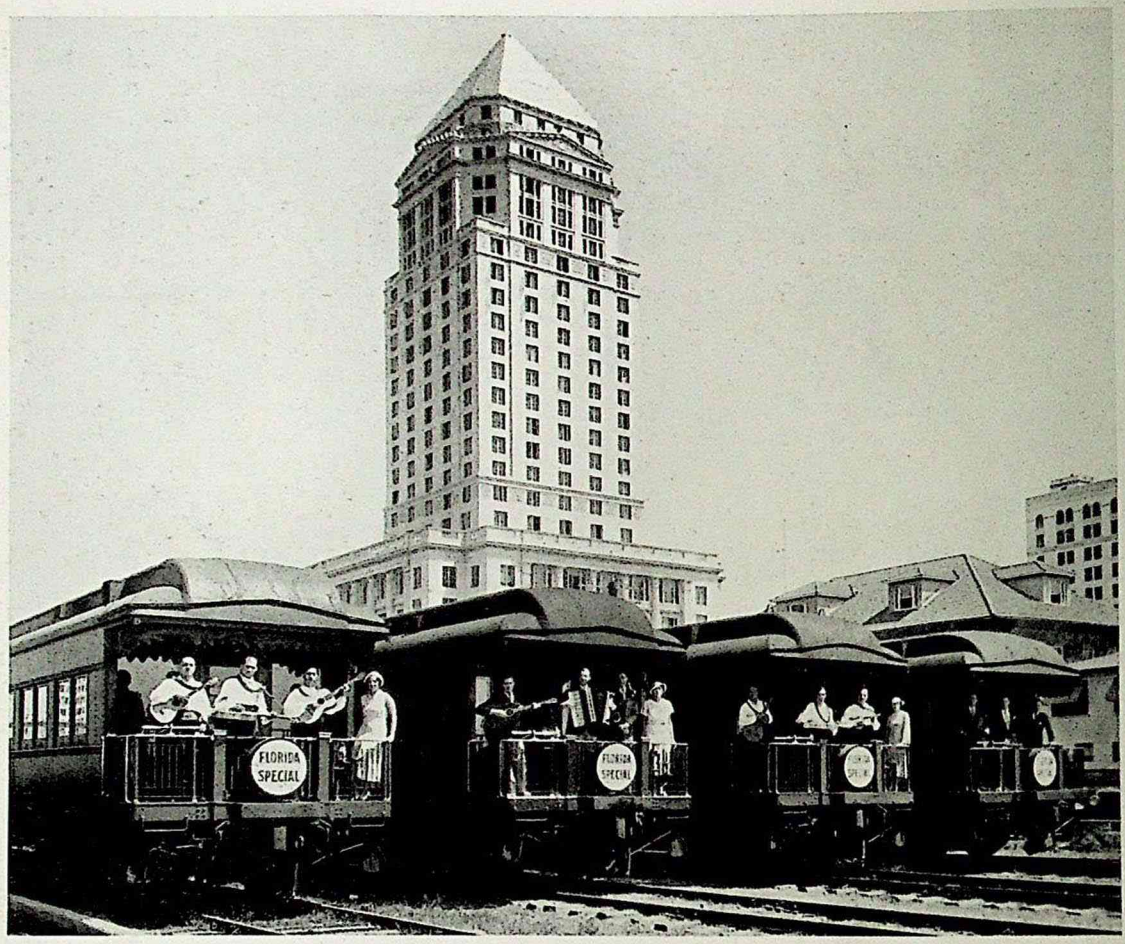
Each road, of course, handles its own accounts. I was taken through the New York Zone Billing Bureau of the Pennsylvania Railroad.

Nearly 200 employees there are engaged in sending out some 18,000 bills a day and handling remittances that aggregate $6,000,000 a month.

There are 217 freight stations in this one zone, which extends from Bridesburg, Pennsylvania, up to Montauk Point, Long Island.

Waybills are speeded by passenger trains and by motorized messenger service. One whole floor is given over to records of all transactions in this area for three years.

If you loaded freight cars to capacity with all the freight the entire Pennsylvania System hauls on an average day, the en-



PIONEER ALL-PULLMAN TRAIN NEARS GOLDEN ANNIVERSARY

Several times the Atlantic Coast Line's historic Florida Special had to run six sections; frequently it has three or four. It begins its fiftieth season of continuous operation in January, 1937. Hawaiian musicians play in each recreation car, where a hostess arranges dances, bridge parties, and games for children. In the background towers Miami's City Hall, with the city's unique skyscraper jail on the upper floors.

gine of this imaginary train would be pulling into New York while the caboose would still be in Wilmington, Delaware.

A CONEY ISLAND OF FREIGHT CARS

To see how a vast volume of freight is handled in transit, the Chicago and North Western Railway's Proviso Yard, 13 miles west of Chicago, affords a good vantage point.

Here I stood at the crest of the "hump" and watched them shuffle thousands of cars about like an invisible hand playing a game with giant dominoes. In came the trains—80-car, 100-car, 120-car trains—along 30 tracks of a receiving yard.

As they arrived, conductors shot their waybills and "wheel reports" into pneumatic tubes to the freight office, two or more miles distant from the trains, for this yard is 5 miles long and spreads over 1,250 acres. There they were transcribed on teletype machines to all the switch towers, the lighthouses of the yards.

Then a train would creep to the hump, beyond which 59 tracks fan out, downgrade, forming the classification yard. As each car crossed the hump, it was cut loose, and the towerman, with teletype sheet in hand, switched it to its assigned track.

Down the tracks roll the cars, without benefit of brakemen, the towermen operating switches and retarders, clamping devices on the tracks which control their speed. Each car passes over seven retarders before it reaches the bottom of the grade and hooks on to its new train.

As soon as a classification track is filled,



WHAT'S WRONG WITH THIS PICTURE?

"They are writing, reading, chatting, ordering refreshments—doing everything except looking out all the windows we put there with not even a back platform to obstruct the view," humorously complained the conductor on the City of Denver (page 547).

a "trimmer" engine pulls the newborn train to one of the yard's 21 forwarding tracks. There engine and caboose are attached and away it goes.

By night the entire yard is illuminated by floodlights like a Luna Park, for the freight must go through 24 hours a day.

You could stand 26,000 cars, rolling stock enough for a goodly sized railroad, in this yard, and there is adequate track to run a train from Chicago to Cincinnati. Sixty switching engines are working there every day, and you can shuffle trains around with the aid of 740 switches.

For less than carload lots there is a freight transfer warehouse under one roof of 21 acres. Through its quarter-mile length run 24 tracks, each with a platform on either side for quicker loading. Along these platforms scurry tractors with their trailer "trains" piled high with parcels. Here 720 freight cars may stand while 42 gasoline tractors and 4,600 trailer trucks unload and reload their cargoes.

Lay the platforms straightaway and you would have a 6-mile boardwalk, ample for a sizable sea resort's wheel chairs and strollers.

The freight agent at this warehouse has the job of loading and unloading 873 cars on an average day, handling 13,980 separate shipments, and supervising 719 employees. In it is a busy cooperage for repairing or rewrapping packages in transit.

BOTTLENECK OF PENNSY'S TRAFFIC

If one retains a youthful urge to see the trains go by, the Enola Yards near Harrisburg, Pennsylvania, neck of the traffic bottle for the Pennsylvania's enormous west-east freight movement, would fulfill his uttermost craving (page 565).

Cars there are shunted about too fast to be halted for inspection. A tense inspector sits in a swivel chair in a pit beneath the track as they approach a hump. Floodlights play on the underparts of the cars. In his hand he clasps a bulb and when he spies a defect he squeezes the bulb and white lime is sprayed over the wheels of the truck that needs repair.

Should there be a major defect in a car carrying perishable freight, a huge crane lifts that car, cargo and all, from the classification track to a repair track, and there every effort is made to have it ready to rejoin its fellow freight by the time the train is made up to leave the yard.

On one busy, but not peak day, July 11, 1936, 9,433 cars were "humped" in 24 hours. In addition, 1,141 cars were relayed through in trains that did not have to be broken up and reclassified.

Enola is "alone" spelled backwards, but the name belies the fact. On that same July 11, what with cutters and brakemen, markers and car riders, inspectors and all, it took 534 men to handle that 24-hour operation of 10,574 cars.

SHOWER BATHS FOR HOGS

Some tracks are equipped with sprinklers, shower baths for hogs on hot days.

The lowly porker, it seems, is the temperamental and pampered passenger of the freights. He grows nervous and loses weight in transit if he gets overheated, chilled, or jolted too much.

Engineers consider him their special bane if he wanders across tracks. A cowcatcher will toss aside a cow or an automobile, but a pig is apt to be ground under the wheels and a hambone has derailed cars.

There are feeding stalls and rest pavilions for cattle at Enola. Federal law requires that all livestock be taken off trains every 28 hours for feeding, watering, and a 5-hour rest.

Faster freights now make only one stop necessary from the packing centers to eastern cities; formerly the animals had to be "yarded" two or three times.

A BONFIRE OF BOXCARS

Across the Susquehanna River from Enola is an isolated yard where nightly last summer blazed a bonfire of 30 or more abandoned wooden boxcars. At first frightened citizens miles away turned in fire alarms when they saw the red glow.

After the reclamation crew salvaged wheels and bars, trucks and bolts, and scores of other parts, permission was given neighbors to help themselves to the wood. Daily they came, usually a hundred or so of these "wood pickers," loading antiquated automobiles, wheelbarrows, decrepit wagons. In adjacent woods and fields rose many a shack built of boxcar parts, and woodpiles of winter fuel.

Complementary to its 1936 program of building 10,000 new steel freight cars, the Pennsylvania is burning up, or breaking down, 32,000 old cars.

When this is done the System will have 22,000 fewer cars, but it will be able to handle more freight.

This economy results from adapting new cars to special uses, from faster schedules and longer trains, from quicker classification and less delay in yards, and from use of some 4,500 of the steel containers in merchandise service.

But the real graveyard of the freight cars, where all the salvaged bones and sinews are shipped, and where worn-out locomotives meet merciful death, is at Conway, near Pittsburgh (page 555).

There is a touch of sadness about a steam engine, half dismantled, its entrails exposed to public gaze; or the sight of iron couplings in last embrace after their cars have been cremated, clasped like two hands excavated from the ruins of a railroad Pompeii.

Crews with acetylene torches, the "burners," they call them, attack the rusted steel cars when they enter Conway, either performing a major operation of repair or demolishing them altogether.

"That man there has helped cut down 20,000 old cars, and has had only one reportable accident among his workers," the superintendent said.

A LIBRARY OF TRAIN PARTS

But the amazing spectacles are piles of parts: 2,240 wheels, like a cubist's nightmare; a stack of 2,000 axles; a small mountain of 10,000 brake beams.

A magnetic crane reaches its gaunt arm over a mound of metal parts the burners have amputated. Its flat disk picks up six tons in its invisible clutch, swings them over to car or conveyer belt, and drops them when the towerman cuts off the current.

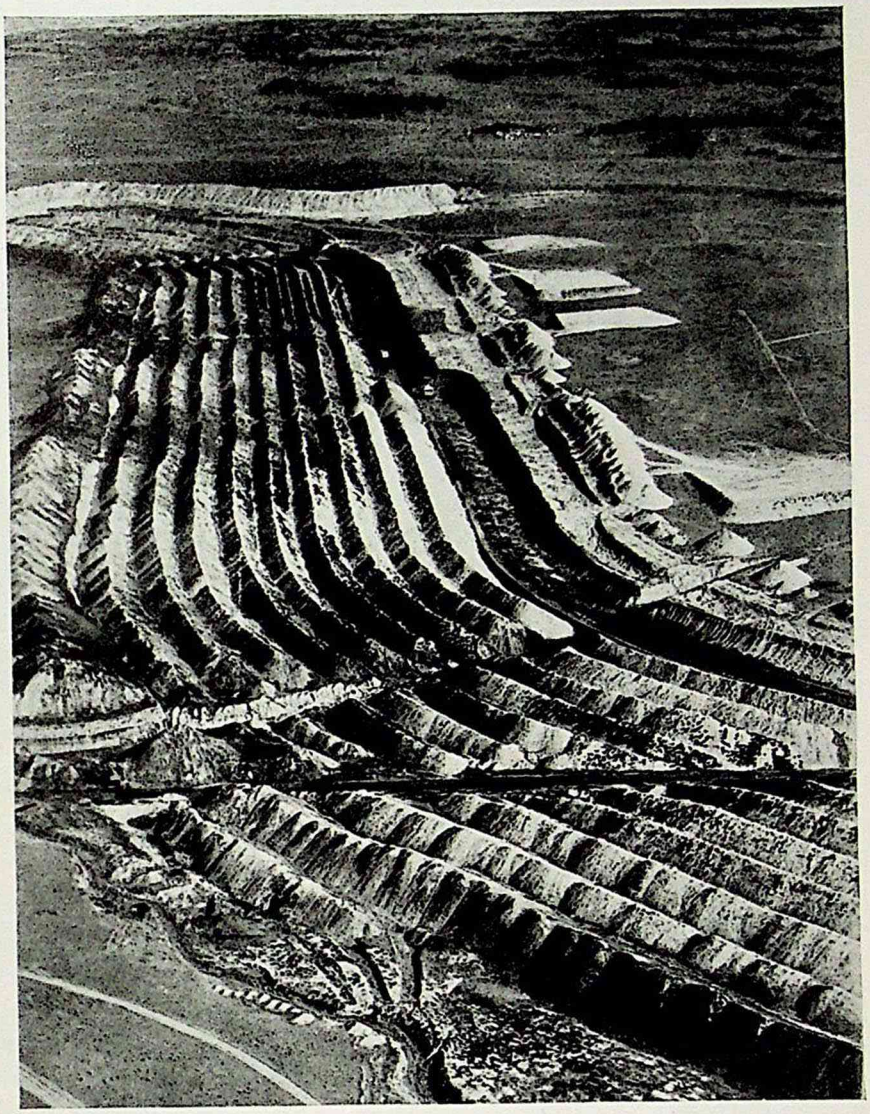
Quick-eyed sorters—it takes three months

to train these cataloguers of a thousand devices—separate usable pieces from the scrap.

Scrap itself is assorted, because it brings more that way, into 34 classifications, such as heavy melting steel, No. 1 cast iron, car steel, malleable scrap, cast iron mixed.

Track bolts are brought into Conway by the carload. Usable ones are plucked from a picking table, gauges applied, then they are thrown into an annealing furnace, put through a threading machine, heat-treated, oil-bathed, and nuts applied. A new bolt and nut cost 12½ cents, the reclaimed pair costs 5.7 cents.

Railroad economies during the depression, effected while actually improving service and keeping labor employed, range from such items as the $145,000 they are saving each day of the year by treating ties, to the 6.8 cents saved by reclaiming a track bolt.



FROM THE AIR A MAMMOTH STRIP COAL MINE LOOKS LIKE FURROWS OF A PLOWED FIELD

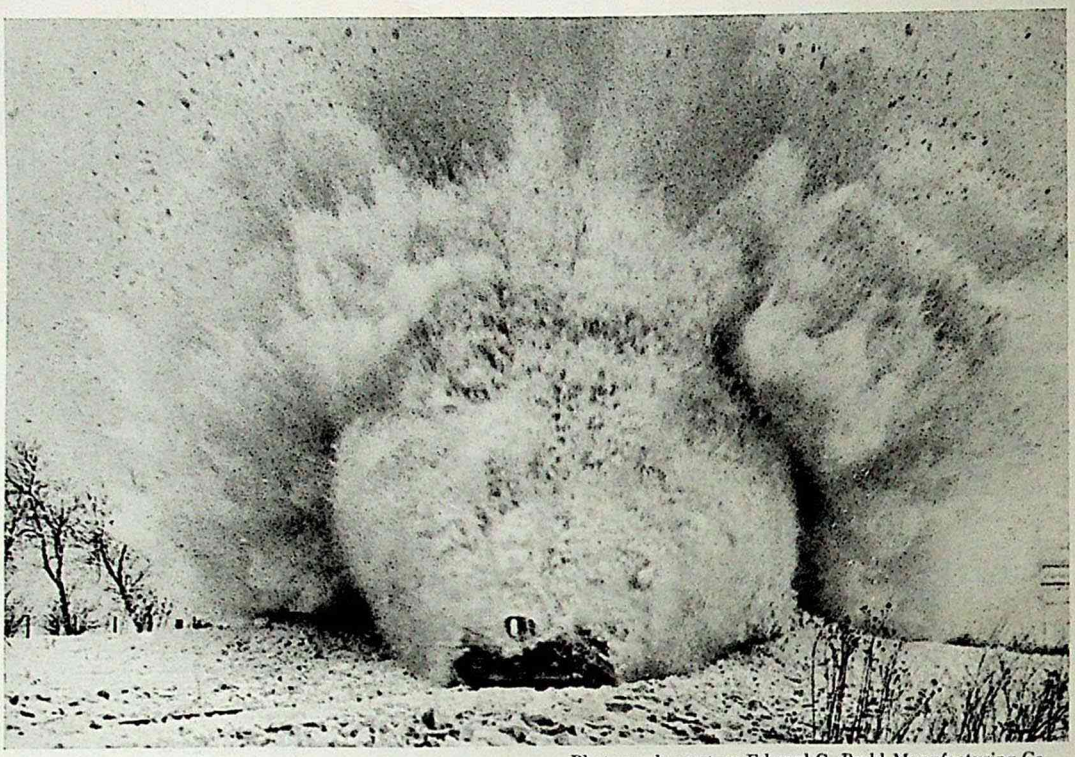
The Northern Pacific digs here at Colstrip, Montana, the fuel for its giant locomotives (page 585). Enormous stripping shovels can gouge a hole big enough for a house cellar, lift 15 tons of earth to the height of a 10-story building, and deposit the load a city block away. The miniature mountains are made when earth is removed to expose the coal. Then the coal is taken out and earth from the last cutting is dumped back into the hole. A 30-mile spur was built to haul the coal to the main line.

Peering through the goggles each visitor must wear, we saw them speeding new steel boxcars down the assembly line just as they do in automobile plants.

Wheels are forced on axles under pressures of 75 to 100 tons. Trucks, with wheels, axles, brakes, and other parts attached, roll in. Sills, supports, cantilevers, floors, sides, ends—all are in place for gantry cranes to swing them to the car. A center sill alone may weigh eight tons.

Riveters swarm over the floor, ride movable platforms along the sides, and crouch beneath on a sort of "kiddy car." Men swing long tongs to toss red-hot bolts to the riveters at 13 positions the embryo car must pass. There are more than 3,000 rivets in a boxcar.

Carpenters have planks at hand for inside floors and walls. Out comes the com-



Photograph courtesy Edward G. Budd Manufacturing Co.

NOT A PORCUPINE COUCHANT, BUT A ZEPHYR RAMPANT

At 80 miles an hour a Burlington streamliner explodes a snowbank near Lee, Illinois, on its dash from Minneapolis to Chicago. The train arrived on time.

pleted car in little more than one hour.

Huge sprinklers deluge it with heavier showers than any rainfall to test for leakage. Then paint is sprayed on, 14 pounds of red paint to a car. It is ready for the rails.

"NOW TRY TO WRECK THESE!"

All over the country railroads and private builders are experimenting with new types of freight cars—end-door cars, ventilated boxcars, gondola cars, stock cars, refrigerator cars, tank cars, and with various materials—Cor-Ten, duralumin, aluminum, and other alloys—in their quest for the magic combination of greatest strength and lightest weight.

"Try these," say the designers. "Run them, smash them, bang them together, wreck them."

To test new brakes tracks are cleared on mountain roads with steep grades and sharp curves. Dynamometer cars are attached with instruments to measure impact, pull, speed, stresses, and scores of other factors, and every few cars there is a "cabin," or "hack" (caboose), with a spacious observation tower (page 555).

They race the cars at top speeds, dash them around curves, apply emergency brakes, and sometimes they do wreck them!

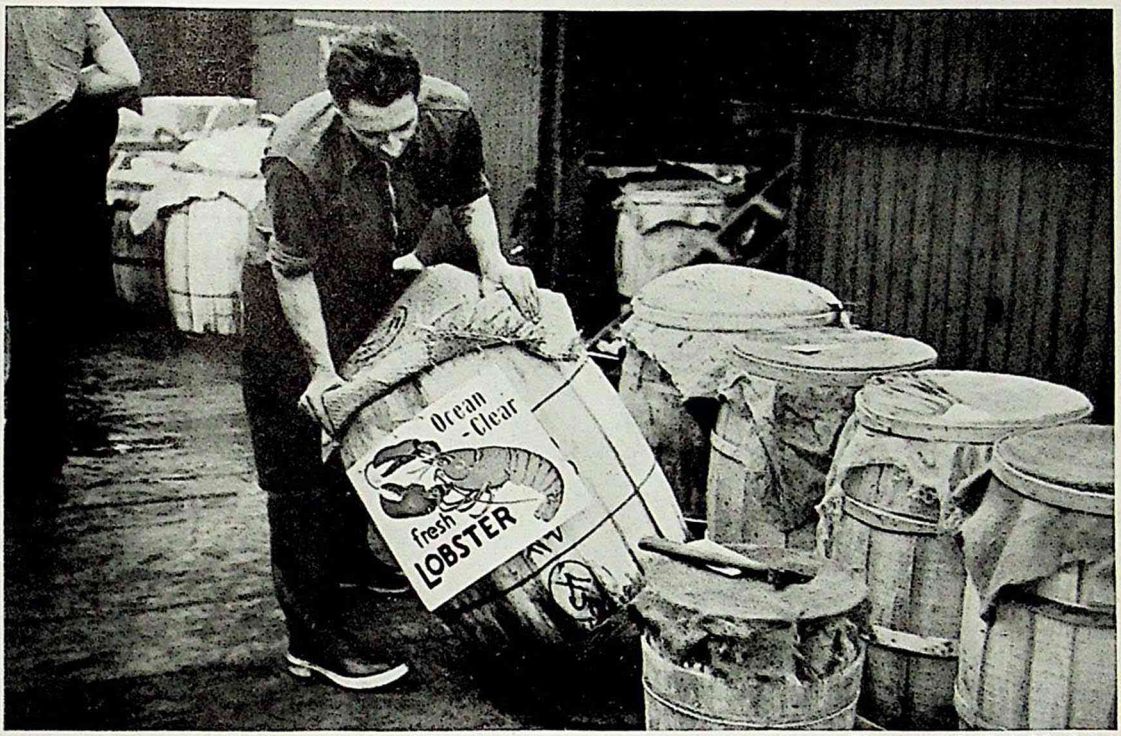
The spectacle is as thrilling as the stunt flights of airplanes, or the automobile races that make motoring safer; only, the railroad tests usually are in isolated places with no gallery of cheering crowds.

From such tests came new air brakes which can handle 150-car freight trains smoothly.

To see quantity building of new cars and locomotives having their faces lifted, one may visit Altoona, Pennsylvania, near the famous Horseshoe Curve.

That city of some 82,000 people, with its 45-degree streets climbing the base of the Alleghenies like an Alpine village, is the most extraordinary all-railroad community in the world.

We counted 43 people boarding a train for Pittsburgh one Sunday afternoon. The agent sold just one ticket—mine. All the others were traveling on passes, including the women, for the Pennsylvania shrewdly gives every employee's wife exactly the same sort of pass her husband holds.



Photograph by Luis Marden

"BROILED LIVES" NOW FOR INLAND CITIES

From Massachusetts Bay north to Nova Scotia lobsters come to Boston by boat, there to be loaded on fast freights for places that never knew them fresh ten years ago (page 557).

In stability the community is like an English manufacturing city. Some family names have been on the payrolls without a lapse since Civil War times.

"That man's father, and his grandfather before him, worked at that same job, in the same shop where you see him working now," the superintendent said.

The big day-in, day-out job at Altoona is repairing the rolling stock. More than 10,000 kinds of parts and material are kept on hand for freight-car repair alone. Soap, to blow bubbles that detect leaks; chalk, to mark dates and defects; rags for cleaning, are purchased by the ton.

One section is busy air-conditioning passenger cars.

The shops have an iron foundry, a hospital, a brass foundry, a fire engine house with two engines, carpenter shops, an artists' studio, a police department, a 4-story testing laboratory, even a photographic laboratory.

One tool shop makes the tools that repair the tools that repair the cars.

Engines coming here for repair, five, ten, fifteen a day, are stripped. Wheels, boxes, rods, crossheads and pistons, link motions, stoker parts, cocks and valves, retaining plugs, scores of other parts, each go to different repair gangs. Getting them all back again is just one mechanical miracle of this house of marvels.

The superintendent said he, too, would like to know how many parts are in a locomotive.

But the room became crowded with foremen, the debate grew acrimonious regarding whether wheels and axles were one part or three, or whether a nut should properly be counted with a bolt; sheets of paper were scrawled with figures. After an hour or so we concurred, "Let's skip it."

A steam locomotive is a massive machine, but it also is an instrument of delicate precision. Its taps must be cut so that there is not more than four one-thousandths of an inch variation between the bolts and the holes they fit.

A steel truck bolster for a freight car weighs 900 pounds. But its surface sidebearings must be gauged not more than one-sixteenth of an inch from the level of the center plate.

It is not surprising that most people have



WILL YOU HAVE A HAM SANDWICH OR A SIRLOIN STEAK?

A popular lunch counter is a Royal Blue feature. In its colonial dining cars the Baltimore and Ohio has reproductions of colonial china and it gives women patrons facsimiles of famous recipes from which some of its dishes are made. This one is copied verbatim from Martha Washington's Mount Vernon cookbook: "To Make a Custard—Take a quart of fweet creame & ftrayne therein 2 whites of eggs & 8 youlks well beaten put them in a difh with a grated nutmegg a little falt & halfe a pound of sugar ftir them well together & foe bake it you may allfoe put in some rofe water if you please" (page 554).

never visited a large freight yard. It is too dangerous. A railroad employee has to learn more safety rules—a 41-page book of them on one system—than he does when he applies for an automobile driver's license.

Guards can spot a visitor in the yard as readily as a sailor can recognize a landlubber. Stepping on a rail, sitting on a tie, or crossing a track nearer than ten feet from a standing train would mean a black mark on his safety record for a railroad man.

But it *is* surprising that among the millions of passengers who buy tickets in railroad stations so few have ever gone through one thoroughly.

STATIONS RANK WITH PUBLIC BUILDINGS

In many cities, Chicago, Cincinnati, Buffalo, Cleveland, Newark, and others, passenger stations rank among the finest public buildings, and are informative museums of modern life.

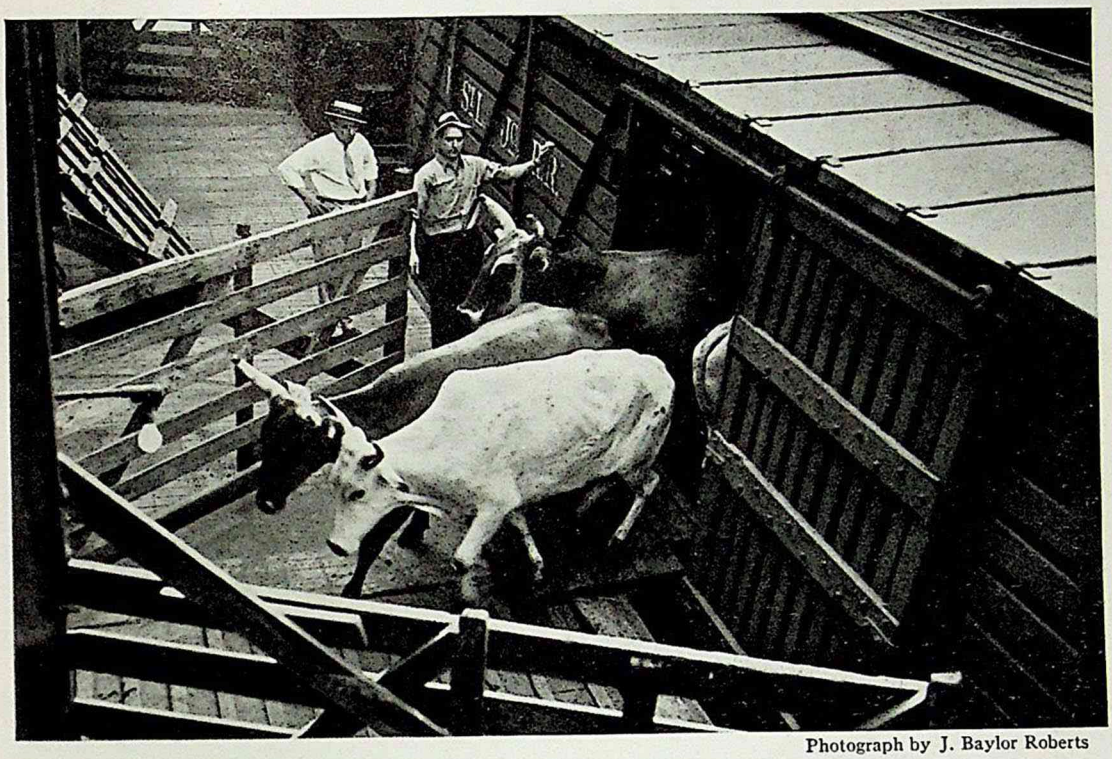
The Grand Central Terminal, in New York, is a seventh wonder of the engineering world, a 48-acre city within a city.

Tracks once barred cross-town traffic north of 42d Street, and steam engines puffed smoke into the heart of high-priced Manhattan real estate where stately Park Avenue and its busy intersections now are located.

To keep on using this valuable area, bounded by 42d and 50th Streets, Lexington and Madison Avenues, for a station and yard entailed a prohibitive cost.

So the New York Central leveled off the surface for these busy streets, erected its mammoth station and adjacent office building, then leased long-term air rights for other skyscrapers, including the new Waldorf-Astoria, loftiest hotel in the world (page 556).

It bored beneath the entire area for one level of 41 tracks, for a lower level of 39 tracks, and then farther down, deep into rock, for a giant power plant which moves



Photograph by J. Baylor Roberts

THEY MAY RETURN TO RAIL AS ROASTS, CHESSMEN, OR TENNIS RACQUETS

Beef cattle from Texas unload at the Chicago stockyards to be converted into many commodities besides meats: brushes, felt, and glue from hair and hides; bottle caps, violin strings, and surgical ligatures from glands and viscera; napkin rings, false teeth, gelatin, and buttons from bones. Some 160,000 cattle and calves are hauled by rail to Chicago in an average month.

its trains, heats and lights the buildings, and runs their elevators (page 544).

A BAGHDAD ON STILTS

Thus every day, over the station tracks, there work in office buildings, or sleep in hotel rooms, as many people as live in Salt Lake City.

They are entirely oblivious of moving trains beneath because building supports are rooted below both track levels, around these supports are clearance spaces, and beneath them are vibration mats of alternate layers of lead, sheet iron, and asbestos.

Imagine the Yale Club built high enough to afford the aggregate floor space of the buildings in this area, and you would have a structure of 1,420 stories, about 3½ miles high. Or, if you would use the equivalent of this floor space for a highway, that would make a 20-foot boulevard from New York to Albany.

Beneath this 48-acre Baghdad on stilts come and go some 600 trains a day, over enough station track to reach from Washington, D. C., to Baltimore, carrying considerably more people daily than live in Springfield, Massachusetts.

It takes more than 400 redcap porters to handle the baggage of this travel army, some 35 men at booths and telephones to answer their questions, a staff of 73 to sell them tickets (page 545).

By day 17 cleaners constantly work at emptying ash trays, spearing discarded chewing gum, and removing debris. About one o'clock in the morning late passengers will see a small army advance abreast, armed with mops, to attack floors and windows. Fifty-nine people work all night long to set the vast station in order.

NICE OPENING FOR A CAVE DWELLER

A cave dweller could spend years in the terminal, with all the comforts of civilization, unless he yearned to swim.

He could telephone from 231 booths; eat at 17 restaurants, milk bars, and soda luncheonettes; buy clothes, shoes, fruit, books, cigars, hats, jewelry, typewriters, cutlery, toy trains at separate shops, and magazines or daily papers from 22 news-



Photograph by J. Baylor Roberts

A BAKED POTATO, TWO POUNDS, 15 CENTS

The North Coast Limited makes a specialty of these giant tubers from the State of Washington.

stands. He could have his clothes cleaned, pressed, or dyed, his hair cut, his prescriptions filled, the story of his troglodyte adventure printed, be treated in a hospital, take shower baths—all within the station.

Then he could have his choice of three hotels and a club, directly connected underground with the terminal, for sleeping accommodations, and more restaurants. He could even acquire an artificial sun tan.

Of course, if he ever wished to extend his undercover excursions into subterranean New York, he could pay a nickel at a subway turnstile, explore much of Manhattan, and touch at points in Long Island and New Jersey without emerging under open sky.

Nearly as many people as live in Washington, D. C., pass through Grand Central Station every weekday. Just now about 600 trains arrive and depart, with approximately 3,000 carloads of passengers, every 24 hours.

The nerve centers of this busy traffic movement are the towers. At one, farthest out, incoming trains are sorted from four tunnel tracks to six tracks bound for the upper level, and four for the lower.

A second tower routes trains from the six upper tracks to the 41 upper-level platform tracks; a third tower sends them from the four lower tracks to the 17 lower-level station tracks.

Two other towers handle movements on upper and lower-level loop tracks and between station tracks and loop tracks.

In each tower a dispatcher sits behind a long table intent upon his train sheets, directing operations of men who pull the levers for signals and switches. Before them a "live map" shows all tracks and flashing light bulbs indicate the train movement on each track.

The towermen need not look out the windows at all to the tracks below; they watch the trains come and go by the red, yellow, and green lights.

Interlocking devices click like amplified typewriters as men work the levers—devices designed to prevent pulling a switch when a light is against it.



TEA FOR TWO, AND A CHAT FOR FOUR

The 11-car City of Los Angeles makes five round trips a month between Chicago and Los Angeles in 39¾ hours. The Union Pacific is a pioneer in streamlining and this is one of its famous "Cities" fleet. The trains enter Chicago over the Chicago and North Western tracks.

"Could you cause a collision if you tried?"

The towerman considered. "I don't think so. I've been here 17 years and I haven't seen one. Of course, that's not long."

To take a train out of Grand Central Station to Mott Haven Junction, five miles north, an engineer must observe 33 separate signals. Also, the fireman must watch each signal and call out its color to the engineer.

When an incoming train passes the tower that controls the platform tracks, a teletype conveys that information to 14 places in the station—to information booths, to information boards, to stationmaster, to gatemen, baggagemen, redcaps, and others.

"No, I don't go home and play chess after a day on this job," remarked the train dispatcher.

THE BIGGEST STATION IN THE WORLD

Although it celebrated its 25th anniversary in 1935, the Pennsylvania Station in New York still is the largest in the world.

Walk around it and you have tramped half a mile, with no more sight of train or track than you would encounter about the Vatican or the Louvre.

The station really is an 8-acre platform, with a mammoth superstructure, bridging the Manhattan mouths of two tunnels (page 542). Some trains run through these tunnels for seven miles, from New Jersey to Long Island, under the Hudson and East Rivers, pausing beneath the station, but never emerging into the daylight or night glow of New York City.

Northbound trains pass the most complex traffic corner in the world, for above the train tunnel, at Herald Square, in the order named, are the Sixth Avenue subway, the Hudson-Manhattan tubes, the street-level bus lines and the Sixth Avenue Elevated. Imagine an airplane overhead, and it would be perfectly feasible for six vehicles to pass that intersection at one time.

It takes a staff of 76 men to sell tickets

at Pennsylvania Station. In a recent normal month they sold 553,204 tickets for $1,595,280.60. The months of Easter, Christmas, and Labor Day raise that volume by a third or more.

Printed tickets ready for sale, 150,000,000 of them, are stored in a room where they are guarded like notes in the United States Treasury.

Some of these tinted, watermarked slips are worth a hundred dollars and more when stamped. The agent pulled out a tray of 50,000 for Long Beach, Long Island, each marked $1.46. Printing a new supply of tickets was just one detail of recent passenger-fare reductions.

Beside each seller's grilled window is a rack from which he flicks out tickets with familiar nonchalance. These racks are mounted on wheels and have folding fronts and locks.

Each seller has his own rack and key. When he goes off duty, he rolls his rack back of the line, locks it, and deposits the key in the cashier's safe. The tickets are charged out to him and he must return the unsold quota and the money for those he sold.

The station cashier's office is like a bank. You may have noticed that when you pay for meals on a dining car you always receive crisp, new bills in change. The cashier must have on hand these "fresh" bills for stewards. Some $3,000 in "ones" are enough five days of the week, but on Saturdays, Sundays, and holidays he must have a stock of $7,000 or $8,000 in ones alone.

THE "ASK ME ANOTHER" BUREAU

Selling tickets, however, is only the final step in a series of events.

"When does the next train leave for Topeka, Kansas?" "What connections do I make for Chicago?" "What is the fare?"

Only a small fraction of such questions are asked in person at the conspicuous information booths. Normally 20 clerks are on duty at a time answering some 700 telephone calls an hour.

The peak of this year's inquiries exceeded 1,100 in one hour before Labor Day. Forty-four clerks work in shifts to dispense information.

For half an hour I watched the smooth operation of the soundproof telephone room and not once did I see a clerk consult a timetable. They are too cumbersome, and tell too little.

Instead, the information chief worked with card-index experts to compile all information about schedules of all railroad, airplane, and bus lines, and all fares on visible card files.

One file gives names of all important golf clubs on Long Island and the nearest railroad station to each club.

It takes poise, tact, resourcefulness, to answer some questions. As examples:

"Do I have a berth all to myself or do I have to share it?"

"What hotels in Washington have swimming pools?"

"My husband left last night on the B. and O. Where is he going?"

"How do I get to Buenos Aires?"

"Have you any hay fever fares to New Hampshire?"

"What time do I get a train to go to Mr. Abram Walker's funeral at Toms Ferry?"

"Should I dress and undress in my berth or in the men's room?"

CALLING PENNSYLVANIA 6-2000

When you reserve a ticket by telephone you call one of the busiest telephone numbers in New York City. In addition to outside lines, 130 branch ticket offices in Manhattan, Brooklyn, and Newark are connected with the central reservation bureau by private wires.

In a spacious gallery from 15 to 20 clerks sit before a series of apertures like old-time village post-office boxes, except that these cases are mounted to move along a track from clerk to clerk.

In the boxes are piled the reservation cards, the kind the Pullman conductor always is fingering just before the train leaves; in each pigeonhole are marked-up cards for sixty days ahead.

Before each clerk is a series of ten red lights and ten green lights. The green lights denote a ticket office call; the red lights an outside call direct from a passenger.

A green light flashed.

"Lower ten, K7, 3 p.m. Chicago. Today. Ticket 7,492. Right."

In very different tone and tempo was the next response to a red light, an individual who must have explanation of price, type of accommodation, daylight time in summer, and a "thank you."

No switchboard operator intervenes in the 10,000 or sometimes many more calls that come in daily. An automatic selector,



A GIANT POWER PLANT OF THE RAILS

Little chance that this boy will grow to the 6 feet 5 inches diameter of the drive wheels on one of the Northern Pacific's new fleet of passenger locomotives. Each is streamlined and carries its 245 tons' weight on 28 roller-bearing wheels. Engine and tender extend 110 feet, more than half the length of the Mark Twain Zephyr train (page 537). A single part of this locomotive, the bed, weighs 38 tons.



Photograph from Wide World

DID YOU EVER SEE ONE RUN LIKE THAT FOR A QUARTER?

The Red Cap Derby was staged in Chicago last July as a part of Railroad Week. The baggage carriers raced for three city blocks with 60 pounds of luggage apiece.

worked out with the New York Telephone Company engineers, routes these calls from ten lines out of the selector room to ten "positions" at the "card tables" in the reservation bureau.

If one operator is busy, the "selector" shunts the call to another, lighting the red or green signal to denote its origin. In an average 24 hours 63 clerks are employed in shifts to make some 8,000 reservations for berths, chairs, compartments, or drawing rooms.

Perhaps the high light of "human interest" in the station is the lost and found storeroom. There were stored and ticketed, the day I saw it, some 240 different items, enough stock for an East Side second-hand store.

The articles included a basket of spectacles, skis, two cats, a bootblack's outfit, books in six languages, a pair of crutches, three sets of false teeth, a restive terrier, dozens of umbrellas, tennis racquets, more than twoscore women's coats, piles of gloves, a fresh sirloin steak (sad harbinger of domestic recrimination), and $20,000 worth of bonds about to be returned by special messenger.

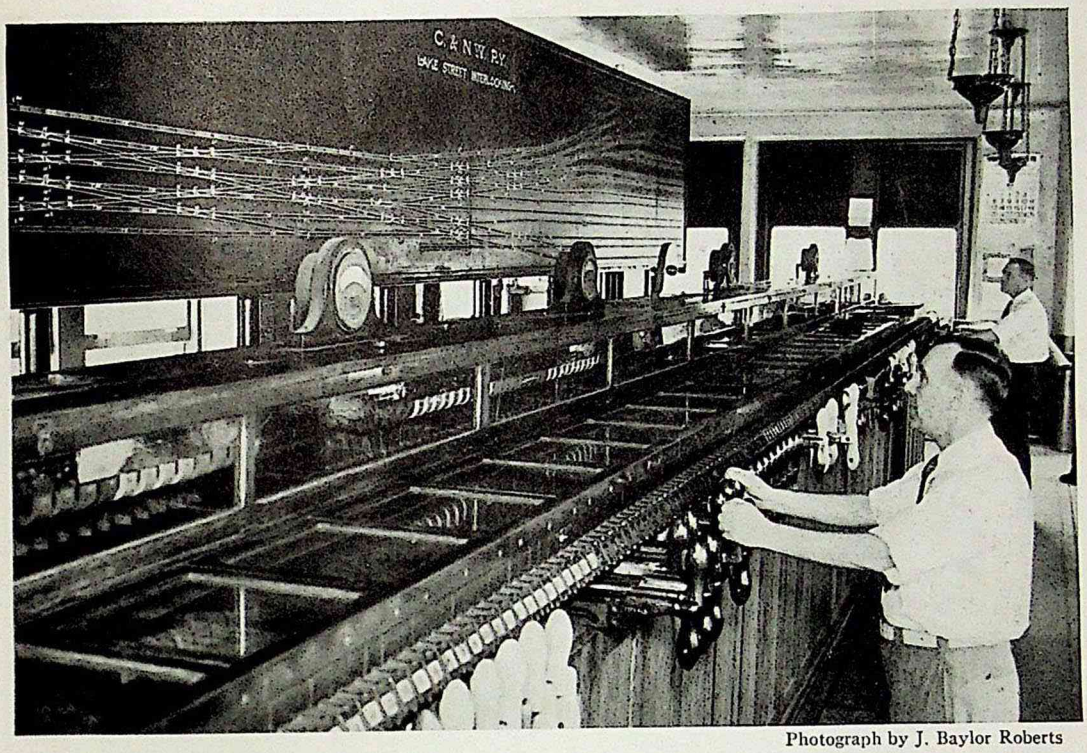
In subterranean corridors, far below the station tracks, were piled hundreds of pigeon crates. As many as 3,200 crates of homers have been shipped in a month, as far as a thousand miles, to be released by baggagemasters for races back to home lofts.

YOUR FELLOW PASSENGERS—HONEYBEES, LETTERS, ALLIGATORS

Other strange shipments come through the station for baggage or express cars—baby alligators, pedigreed chicks, honeybees, game, thousands of crates of "mail order eggs," and bullion cargoes accompanied by 25 or 30 armed men.

Saturday nights from 75 to 80 trucks race with their loads of Sunday papers to catch the baggage cars attached to the "paper trains." One newspaper's early Sunday edition goes to press at 9:10 p.m. and is loaded on a train leaving at 9:50. If the driver gets held up by a single traffic light the stationmaster must hold the train.

Some 150 carloads of mail are handled in and out of this station every day. If the sacks were piled and hauled along platforms passengers would not have space



Photograph by J. Baylor Roberts

BY ILLUMINATED MAP AND INTRICATE LEVERS 267 TRAINS ARE ROUTED DAILY

There are 170 working levers in this Lake Street Tower of the Chicago and North Western Railway Station at Chicago. Six main tracks branch out to 16 in the train shed, over which nearly 60,000 passengers arrive and depart every 24 hours. The light-colored levers control signals, the dark ones operate switches. Interlocking devices prevent clear signals being set on occupied tracks. In and out of this station daily runs the "millionaire club car," the "Deerpath," attached to a suburban train. Members charter the car, engage their own attendants, and vote on new admissions from a long waiting list. A golf special is operated Saturdays to North Shore points. All trains of the Chicago and North Western run on the left-hand tracks, as they do on English lines, because early double tracking was constructed by British and Dutch engineers.

to board trains. They are dropped through trap doors beside mail cars where conveyer belts carry them to huge separating tables.

There men assort the bags as they pour in and pitch them into chutes for other belts that run beneath the street to the City Post Office adjoining, or to belts that connect with outgoing trains.

Around special tracks, to which passengers are not admitted, where mail cars await loading, are spy galleries from which postal inspectors, unseen by the workers, may watch the operation.

Nearly 150,000 sacks of mail a day, about 1,500 trunks and other checked baggage, 2,200 pieces of hand baggage checked in parcel rooms and a thousand more pieces in parcel lockers, from 20,000 to 30,000 pieces of parcel post—these are some of the operations that must not obtrude upon passenger comfort.

You buy a ticket, you board a clean, cool train, you read a newspaper, you stroll into the dining car for luncheon. Few people are conscious of the complex task of getting a train ready for occupancy.

THE "MAKE-READY" FOR A RUN

Out in Sunnyside Yard, at the Long Island end of the Pennsylvania's New York tunnels, 43 trains back in after runs in one span of 58 minutes.

There each engine is inspected; a quick check of 30 or 40 parts takes 25 minutes if nothing much is wrong. Squads pounce on the cars, shower-bath the outside, wash the windows, clean the interior, replenish water and ice, report any needed repairs.

More than a hundred engines and some 750 passenger cars are gone over each day, and it takes nearly a thousand men for the cars alone.

Water lines, air lines, steam lines, battery charging lines, all are laid in trenches



Photograph by J. Baylor Roberts

THE STREAMLINED MERCURY LEAVES CLEVELAND'S SKYSCRAPER TERMINAL

Towering more than 700 feet over the Public Square, Union Station dominates a city center that includes a hotel, office building, bank, Medical Arts Building, the Post Office, and a department store. Harvey Restaurants in the station, ranging from banquet hall to coffee shop, could serve luncheon to every resident in a city of 10,000 people. The tender of the ultramodern Mercury's huge engine carries enough coal, 16 tons, to heat a suburban home for the winter, and enough water, 15,000 gallons, to supply an average family for ten weeks.

along the 76 tracks. Ice for the coolers and for those cars which are not mechanically air-conditioned is stored at both ends of long platforms. Tractor trailers load at one end, fill the car containers, and load again at the other end to avoid an empty return trip.

On warm days last summer as many as 400 tons of ice were piled into passenger cars here in 24 hours.

SUPPLYING RESTAURANTS ON WHEELS

In one building of the 72-acre yard is the supply warehouse for dining cars—a department store of grocery, butcher shop, cold-storage rooms, and long shelves of china, silver, and linen.

Meat cutters chop and weigh steaks; inspectors scan bushel lots of beans, carrots, oranges, berries, potatoes; white-clad men slice ham for sandwiches, others apply bread and wrap them in glazed paper; seamstresses mend tablecloths and napkins. Clerks pack each car steward's order into large hampers.

One employee is listed as a "tomato ripener." He has charge of the spacious, airtight room where crates of the vegetables are stored.

He speeds up or slows down the ripening of tons of tomatoes, according to the day's travel prospects, by judicious use of ethylene gas.

We had luncheon in the "dummy diner," built into an upper floor of the building, where chefs are trained, new recipes tried out, and waiters instructed. Except for an open side on the corridor, this diner is precisely like those on wheels in its dimensions, appointments, decorations, kitchen equipment and utensils, and tableware.

A steward is there to ask officials and visitors whether everything is all right, and bills are made out, though not paid, to carry through the final stage of a dinner on the train.

"CAN YOU MAKE AN OMELET?"

In an office outside twelve chefs were waiting to apply for jobs.

"What do you do about them?" I asked.

"Tell them to go into the kitchen and make an omelet. Then we watch them to see whether they know what utensils to use. If they fumble on that, the interview is over. But if an applicant knows his way around a kitchen, we put him through a series of tests with other recipes, we examine his credentials and his health, and place him on the waiting list."

On an average day the entire Pennsylvania Railroad serves about 6,500 dinners. That would be a sizable crowd for the largest hotels, but the problem is complicated by the fact that the meal is served in 130 restaurants on wheels and that each restaurant must have its own steward, chefs, waiters, and supplies.

Most popular summer dish is the PRR Salad Bowl; around 35,000 are served in a month. The railroad's average daily shopping list includes 847 pounds of ham, 575 dozen eggs, 750 lamb chops, 1,695 one-pound loaves of bread.

There is a laundry here for a portion of the 24,000 pieces of linen that must be done every day. And aboard the cars are washed daily 140,000 dishes and 24,700 pieces of silver, knives, forks and spoons.

To this yard report daily some 500 Pullman porters, to help care for 6,200 persons who sleep as they ride. They must be supplied with 12,000 pillows and 18,000 sheets nightly.

Here the Pullman Company has one of its laundries, which averages 85,000 pieces of linen a day.

"DOUBLE-HEADERS" AND "HIGH BALLS"

At Sunnyside awaits the "wreck train" for the order to "get the hook," meaning the mobile crane which can toss a 50-ton obstruction off a track.

Perhaps railroad slang was the origin of that expression, just as the most sober group of men in the world still talk of "high balls," a term carried over from the days when a ball hoisted on a high post meant a clear track.

Did the theater take over "deadhead" from the railroad pass bearer? Did a "double-header" mean two engines on a train before it referred to baseball games? A locomotive is a "hog," a conductor the "captain," an engineer the "hoghead," and an official of the road knows full well that, with no disrespect, he is referred to as a "tin hat."

Herein have been pictured some of the sights and scenes of railroading, an essential and a romantic industry. They are typical, but not yet universal. Smaller lines and branch lines of major railroads, especially the commuters' trains of many cities, still lack new equipment and air-conditioned coaches.*

In rail transportation, as in civilization, one may find almost all stages of development. On one short line the general factotum of the station loads baggage, sells tickets, and calls the train. Then he slams down his window, changes his station master's cap for that of a conductor, boards the train, and collects the tickets.

AN END-TO-END TRAIN PICTURE

To visualize the volume of freight and passengers hauled by all the railroads of the United States is difficult. To say that the 1,964,000 freight cars would make a train reaching two-thirds around the world at the Equator is accurate, but no human eye could encompass such a spectacle.

Perhaps the plain figures are most impressive.

To the rolling stock of nearly two million freight cars add 48,300 locomotives and 43,800 passenger cars.

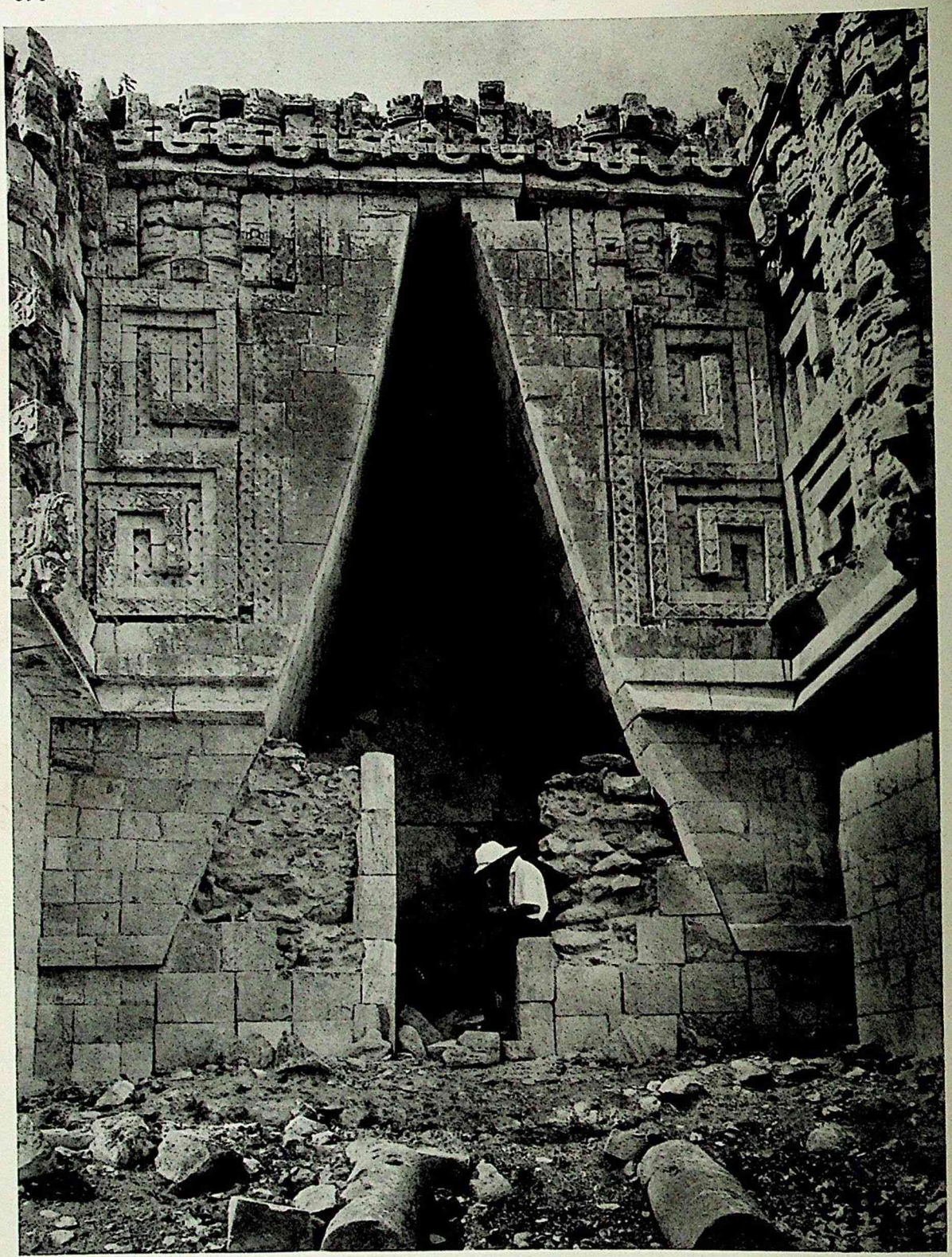
Imagine, if you can, 1,400,000,000 tons of freight hauled each year, at a cent a mile, in addition to hundreds of thousands more tons of mail, express, and baggage.

There are 450,000,000 passenger hauls—four 40-mile rides for every man, woman, and babe in arms in the United States, at an average of about two cents a mile.

To move that traffic over highways would require more trucks and busses than the 21,500,000 private passenger automobiles of the entire country.

Yes, there is plenty of business for the railroads!

* This article summarizes important improvements and experiments being made on the progressive railroads of the United States since THE NATIONAL GEOGRAPHIC MAGAZINE's last survey of the railroads in "America's Amazing Railway Traffic," by William Joseph Showalter, April, 1923.



AMERICAN INDIAN ARCHITECTURE REACHED ITS ZENITH IN THE HOUSE OF THE GOVERNOR AT UXMAL

This magnificent edifice surmounts the topmost of three terraces, some 50 feet above the general ground level, the lowest terrace covering about five acres. The building is about 300 feet long and 25 feet high. The upper half of the façade on all four sides presents an intricate sculptural design composed of some 20,000 individually cut stones. Originally the building was pierced by two arcades which permitted passage from front to back, but later these were converted into extra rooms by being walled up as shown here.

YUCATÁN, HOME OF THE GIFTED MAYA

Two Thousand Years of History Reach Back to Early American Temple Builders, Corn Cultivators, and Pioneers in Mathematics

By Sylvanus Griswold Morley

Carnegie Institution of Washington

With Illustrations from Photographs by Luis Marden

THE Peninsula of Yucatán projects northward between the Caribbean Sea and the Gulf of Mexico like the thumb of a giant hand. Located in its northern half are the States of Yucatán and Campeche and the Territory of Quintana Roo, in the Republic of Mexico.

It is almost as flat as the proverbial pancake, though, as one travels from north to south, a few low ranges, little more than foothills, are encountered, few exceeding 500 feet above the sea. The country is a flat, limestone plain of recent geologic formation, covered with a dense, rather low forest which increases in height from north to south as the soil grows deeper.

Yucatán has no surface water, no rivers or streams, and relatively few lakes, but everywhere are to be found large natural wells called *cenotes,* which made life possible in ancient times. In the formation of these, the surface coralline limestone, honeycombed by the action of water, has broken through, exposing the subterranean water level.

The cenotes and modern wells vary in depth directly with the increasing elevation of the land as one withdraws from salt water, from only a few feet at the coast to about 100 feet in the interior. The level of the subterranean water table, however, always remains the same.

There are only two seasons, the dry and the rainy. The former begins in December and lasts officially until May 3, Santa Cruz Day, when the faithful believe the rains should commence, though actually it may have been raining since the middle of April, or Nature, in a contrary mood, may have held off until the middle of June.

The thermometer does not fall below 39 degrees Fahrenheit, and does not rise above 107 degrees. But these two extremes do not tell the true story, since the average maximum is in the eighties and the average minimum in the sixties.

The nights, even after the hottest days, which are in April and May before the rains break, are cool, because of the trade winds which sweep across the peninsula from east to west practically throughout the year, bringing the freshness of the Caribbean Sea to cool the sun-parched land.

ISOLATION MAKES YUCATÁN A "LABORATORY CASE"

Although Yucatán is a peninsula joined by a broad base to the continental land mass to the south, it is, practically speaking, an island (map, page 595). For every person who manages to fight his way into the peninsula through trackless jungles, across vast swamps and over stony ranges of low hills which together form an all but impassable land barrier, hundreds reach Yucatán by air or water.

This circumstance profoundly affected the civilization which flourished there in ancient as well as in modern times.

Because of its almost complete isolation, the peninsula was selected by the Carnegie Institution of Washington (D. C.), more than two decades ago, as a center for the intensive study of American aboriginal civilizations. Foreign influence having been reduced to a minimum, Yucatán is an excellent "laboratory case" for such a study.

This subtropical paradise is not difficult of access from the United States. Mérida, the capital, is only nine hours by air from Miami and less than six and a half from Mexico City. There are regular steamship sailings from New York and from New Orleans to Progreso, port of Yucatán. There is every facility for convenient touring about the peninsula, even the modern Mayaland lodge in the venerable ruins of Chichen Itzá.

Mérida, with about 110,000 people, must be one of the cleanest cities of its size in the world. All the streets are paved. Ninety



Photograph by Dr. Walter M. Simpson

GRANDMOTHER GOES TO MARKET

The Maya, like other primitive peoples, have learned that the most efficient way to carry objects is on the head or back rather than in the hands. Thus masons transport blocks of stone weighing up to 200 pounds, and the Maya women balance baskets of food and clothes.

percent of the houses are of rough masonry coated with lime plaster. Flat concrete roofs rest either on wooden beams or, in the modern houses, on steel beams.

The houses are painted in every color imaginable, pastel shades of cream, pink, green, blue, and yellow prevailing (p. 638).

As in all Spanish cities, the dwellings present to the streets either entirely blank walls or heavily barred windows, but, once within the great front doors, even the humblest have their enchanting patios. In the more pretentious homes broad-arched cloisters with tiled floors surround the patios on all four sides, and in more modest ones on one or two sides.

The patio itself usually is a riot of brilliantly colored tropical flowers, many of which distill rare perfumes.

"FIRST FAMILIES" WERE CAVE DWELLERS

Today, with its well-lighted, clean streets, its many parks, its movies, electric signs, autobusses and milling newsboys, bootblacks with their little portable boxes, and sweetmeat venders, Mérida is a city of the 20th century.

But with Maya Indians in their picturesque native costumes rubbing shoulders with Mexicans in the more familiar habiliments of the modern world, even with American visitors in plus fours strolling beneath the medieval dignity of the Cathedral towers, a thousand years of human history unfold before the eye (p. 635).

The story of man's earliest occupation of Europe has been recovered from the caves of France and Spain, so in Yucatán the archeologist naturally turns to the caves, of which there are many, for evidence concerning man's antiquity in this region.

It would seem that the dwellers in the caves were the same people as the builders of the great cities of stone, since excavations disclose that both appear to have used the same utensils, the same kinds of dishes,

bowls and water jars, the same kinds of corn grinders, arrow- and lance-heads, fiber cleaners, pottery burnishers, and the same kinds of jade ornaments, earplugs, noseplugs, beads, and pendants.

However, about the builders of the cities of cut stone, the ancient Maya, the archeologist knows more than a little, and with the Maya the clouds of obscurity surrounding the ancient history of Yucatán begin to dissipate.



NO MORE CLOTHES THAN THE PUPPIES HE HOLDS

This little Maya man of Pisté, near Chichen Itzá, plays contentedly all day, taking fatherly care of his younger brothers and sisters. When he is about six, he will be sent to the forest to bring in loads of wood on his back for the kitchen fire. In humble households such as his there are no idlers.

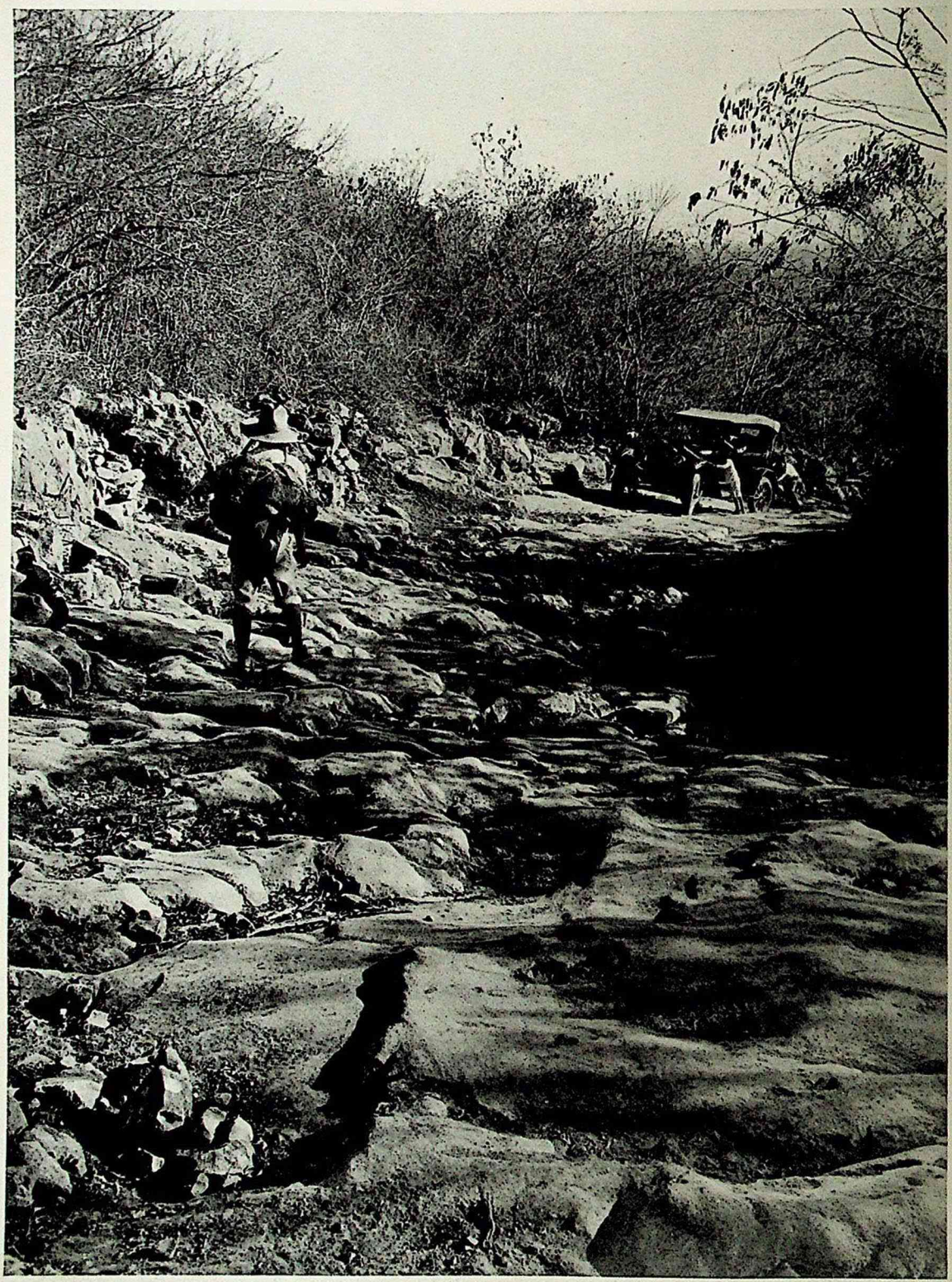
GREEKS OF THE NEW WORLD

Sometime during the early years of the Christian Era there developed in what is now the northern part of the Republic of Guatemala—more exactly, in the Department of Petén, Guatemala, south of Yucatán—a civilization which archeologists have called the Maya.

This civilization, which was destined to become the most brilliant cultural expression of ancient America, was based upon agriculture, chiefly the raising of corn.

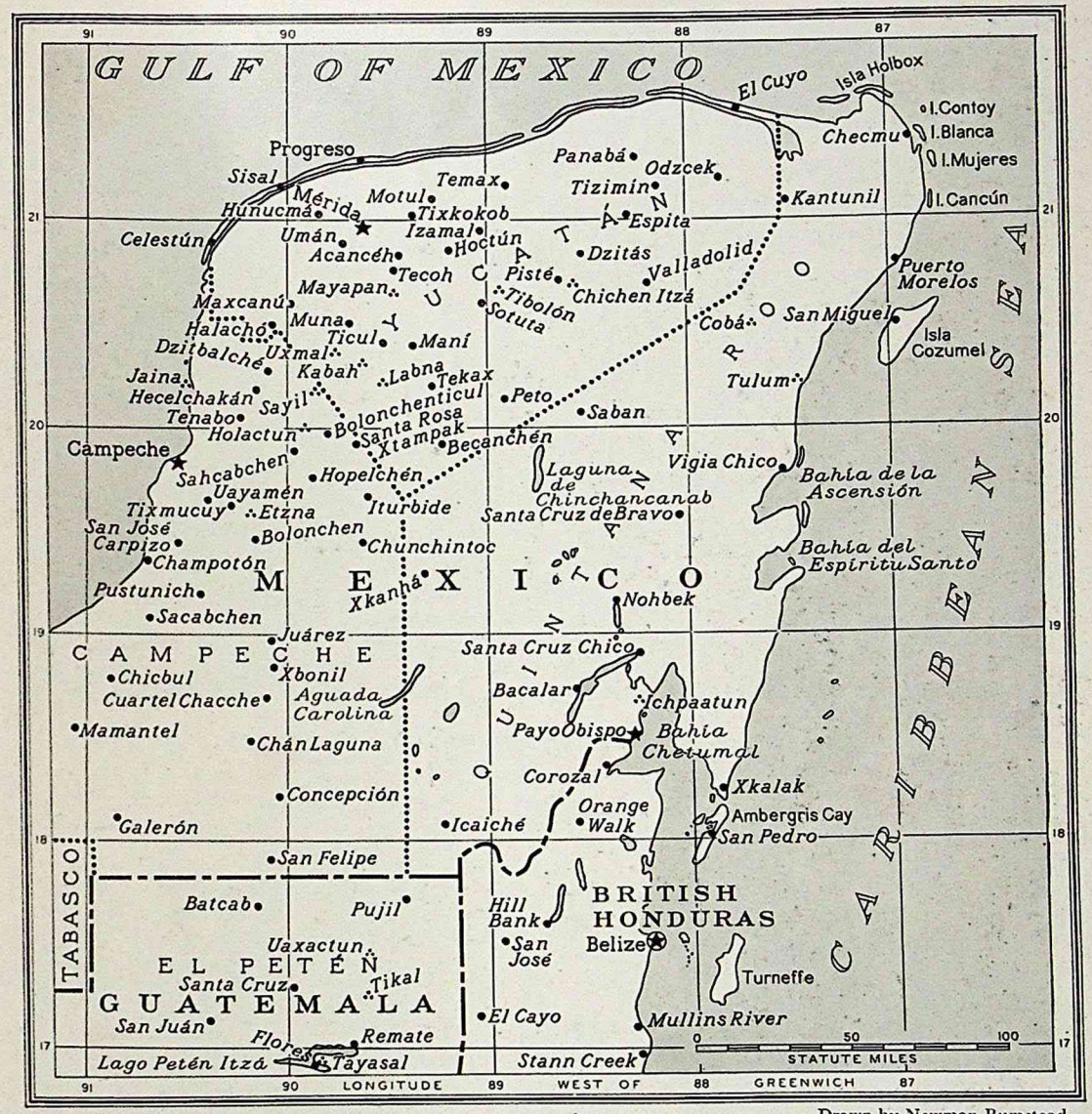
Because the early Maya were primarily farmers, they became interested in the phenomena of time, the passing of the seasons, the several stages of the farmer's year—when the forest should be felled, when the dried wood and leaves should be burned, when the corn should be planted, and when harvested. All these were of vital concern, so their priests at a very early date, probably by the beginning of the first millennium before Christ, turned their attention to the measurement of time and to the study of astronomy.

Although the Maya in their knowledge of the apparent movements of the heavenly bodies—the Sun, Moon, Venus, and probably other planets as well—far excelled both the ancient Egyptians and Babylonians, their greatest intellectual achievement was the invention of a chronology, exact to the day within a period of 374,400 years, which is as accurate as our own Gregorian



NOT A BOWLDER-STREWN STREAM BED, BUT A ROAD IN NORTH-CENTRAL YUCATÁN

Bedrock is only a few inches below the surface, and highway making without blasting is a hopeless task. Over stretches like this only an automobile with high axle clearance can travel. It took the author one hour and three quarters to cross this range, a distance of only two or three miles. Wise motorists get out and push where outcroppings of the native limestone make natural hazards.



Drawn by Newman Bumstead

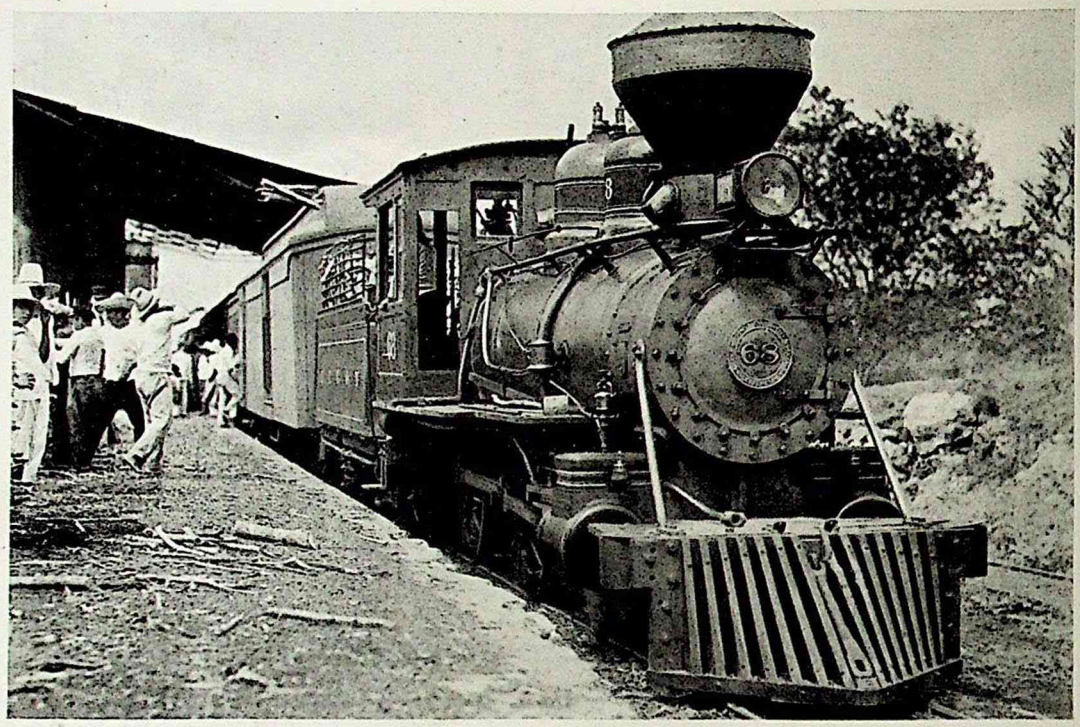
THE YUCATÁN PENINSULA IN EFFECT IS AN ISLAND

Like a giant Mexican thumb, it points toward Florida across the Gulf of Mexico. Because it is difficult of access by land, this home of "the New World Greeks" is a natural laboratory for the study of the agriculture, architecture, and other amazing achievements of the Maya. Now airplanes from Miami and Havana, and steamers from New York and New Orleans bring increasing numbers of visitors to see the descendants of this cultured people, living among their ancestral ruins, with many customs unchanged for the last 2,000 years.

Calendar. For the first time in human history, their mathematical system to keep account of this chronology made use of a positional system of writing numbers involving the conception of the abstract mathematical quantity of zero, one of the outstanding achievements of all time.*

While our own numerical system is decimal, increasing by tens from right to left of the decimal point, the ancient Maya system was vigesimal, increasing by twenties from bottom to top. But all the essential elements of our own modern arithmetic, including numeration by position and use of a symbol to represent zero, had been devised by the ancient Maya 2,000 years ago, and at least five centuries before the Hindus had developed the fundamentals

* I have explained the rudiments of the Maya Calendar in "The Foremost Intellectual Achievement of Ancient America," NATIONAL GEOGRAPHIC MAGAZINE, February, 1922.



RURAL TRAINS ARE DRAWN BY WOOD-BURNING ENGINES

At each station men toss fuel into the tender from convenient piles stacked beside the track, while the passengers casually pass the time of day with relatives and friends. These locomotives are of ancient American vintage. Despite their age, they rarely break down and the passenger usually "gets through," well covered with wood cinders.



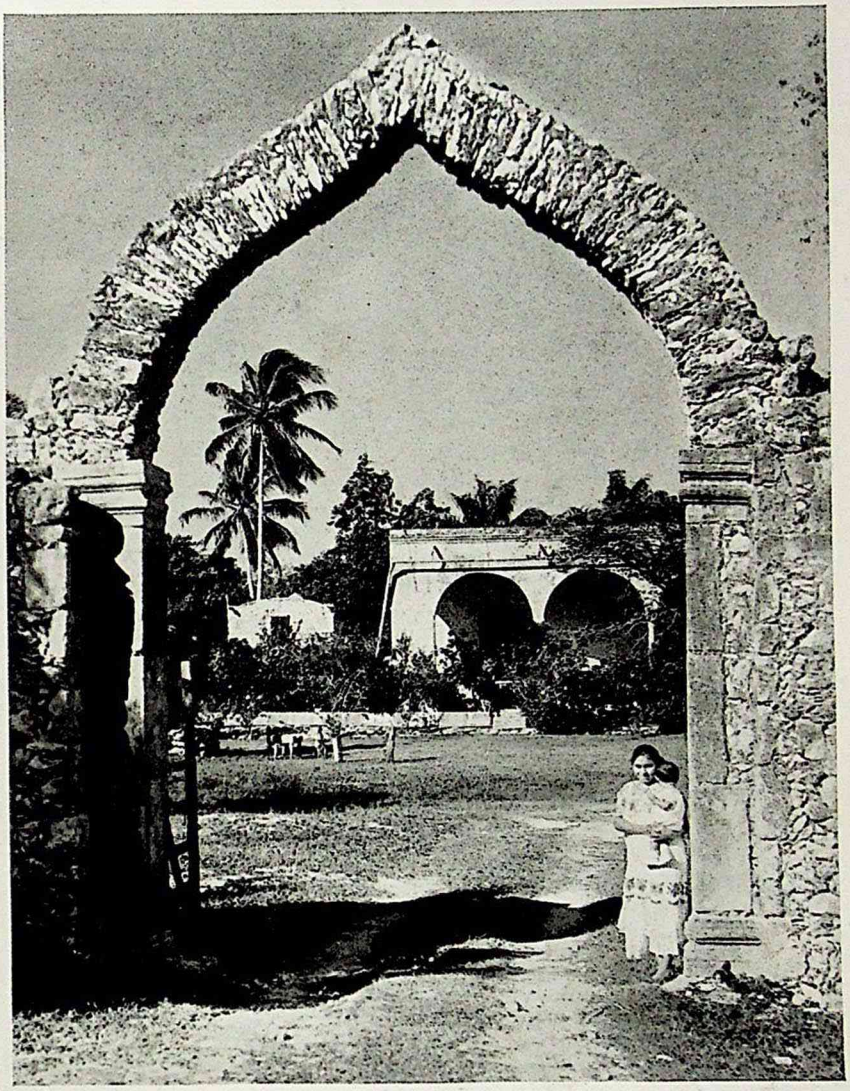
Photograph by Franklin L. Fisher

PEDRO, ENGLISH-SPEAKING GUIDE, STANDS BETWEEN "ATLANTEAN" COLUMNS

In the area known as Old Chichen Itzá, pillars of several buildings are carved to represent human figures with arms raised above their heads; hence the name applied to them. They are sometimes found in interiors, but more frequently in façades, as here.

of Arabic notation in India.

By their exceedingly accurate system of chronology as well as by their knowledge of the apparent movements of the heavenly bodies, the Maya priests were able to predict eclipses and the heliacal rising and setting of Venus. Moreover, what was of even greater importance to the Maya farmer, they had determined the length of the tropical year with as high a degree of accuracy as Pope Gregory XIII did a good thousand years later.



ARCHEOLOGISTS USE THIS HACIENDA AS HEADQUARTERS

The house was not built until about 1734, but there was a cattle ranch on the site here at Chichen Itzá a century and a half earlier, and the old stone gateway leads into what was formerly a corral. The arch with its pointed top reflects the Moorish influence seen so frequently in the present-day architecture of Yucatán.

A CIVILIZATION FOUNDED ON CORN

The Maya civilization, being founded upon corn, the increasing production of this ancient Maya staff of life, due in no small part to the excellent service of their local weather bureau officials, the astronomer-priests, made possible the accumulation of food reserves.

The growing wealth meant more and more time off from the imperative routine of keeping body and soul together, so that an increasing number of people were able to turn their leisure time to other pursuits, such as architecture, art, sculpture, painting, ceramics, jade engraving, weaving, and featherworking, all of which crafts were highly esteemed by the ancient Maya.

Thus, during the fourth to eighth centuries of the Christian Era, there grew up numbers of cities, with public buildings made of stone, decorated with stucco, and brilliantly painted.

There were lofty pyramids, surmounted by towering temples, progenitors of our modern skyscrapers; great monasteries for the numerous priesthood; probably palaces for the ruling caste; astronomical observatories; ball courts, where a game something like our modern basketball was played; vapor baths, and other specialized masonry constructions.

These buildings were arranged around the sides of large squares or plazas, or on top

of artificially raised terraces sometimes of enormous extent. In the plazas and on the terraces stood beautifully sculptured monuments, ranging from 5 to 25 feet in height.

These were erected usually at ten-year intervals to commemorate the principal astronomic events of the past decade, to set forth the corresponding calendar corrections for the period, like our own leap-year corrections, as well as for other ceremonial and religious purposes.

THE AMERICAN INDIAN'S ZENITH

This first florescence of the Maya culture I have called the Old Empire. It was the highest civilization, judged both by its intellectual and esthetic achievements, ever produced by the American Indian. The Old Empire was probably not so much a political entity as a cultural unit, like the ancient city-states of Greece, Athens, Sparta, and Corinth, or the city-states of Italy in the Renaissance, Venice, Genoa, and Florence.

The Maya probably did not constitute a political unit at all, strictly speaking, but rather a loosely associated group of powerful communities enjoying a common and exceedingly homogeneous culture.

The Old Empire stretched from what now is western Honduras to the highlands of central Chiapas, Mexico, always, however, keeping to the Atlantic side of the Continental Divide. Thence it extended northward across the heavily forested lowlands of northern Guatemala (the Department of Petén) and the adjacent parts of the States of Chiapas and Tabasco, Mexico, on the west and British Honduras on the east, and still farther northward into the Yucatán Peninsula (map, page 595).

However, it should be borne in mind that the northern half of the Yucatán Peninsula, which I have called the New Maya Empire, was only a provincial region in Old Empire times. It did not reach its cultural zenith until the 12th, 13th, and 14th centuries.

THE COLLAPSE OF THE OLD MAYA EMPIRE

During the eighth century one by one the cities of the Old Empire ceased to build new temples and palaces, ceased to erect sculptured stone monuments with hieroglyphic inscriptions setting forth their respective dates in the Maya Era; ceased, in fact, to function as governmental and religious centers. The administrative leaders and the priesthood, who together had made the Maya what they were, withdrew to Yucatán. The common people soon fell away, and finally the former centers of teeming population were abandoned.

The forest returned, and again the jaguar, tapir, peccary, and deer stalked the courts where kings had ruled and priests performed their rites of human sacrifice (Plate XVII).

Earthquakes, foreign conquest, civil war, recurrent epidemics of yellow fever and malaria, climatic changes bringing an increased rainfall so abundant that the land was no longer tillable by the Maya system of agriculture, intellectual and esthetic exhaustion following a long period of forced productivity, social disorganization, political decay, and governmental disintegration—all these have been assigned at one time or another by different writers as causes for the collapse of the Old Empire.

While some of these factors undoubtedly played their part in Maya decline, especially social and governmental disorganization, I believe the chief agency which brought about the fall and abandonment of the Old Empire civilization was an age-old economic principle, the law of diminishing returns.

The primitive system of agriculture practiced by the Maya consisted in felling a patch of forest at the end of the dry season, in December or January, in burning it toward the end of the dry season, in March or April, and in planting it at the beginning of the rains, early in May. This procedure had two serious drawbacks (Plate XXIV).

First, long experience showed that the crop of corn harvested the second year from any given field was only about two-thirds as large as the first year's yield, while the third year's crop had shrunk still another third.

Corn experts from the United States Department of Agriculture who have studied the problem at first hand in Yucatán, where the modern Maya still practice the same system of raising corn, believe that the decreasing yield each succeeding year is due to the intense competition that the growing corn suffers from equally thriving weeds, which, by the third year, have become so thick as to choke out the corn.

In practice today the Maya find it easier to clear a new patch of the forest and make a new cornfield than to fight the exuberant



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Finlay Photograph by Luis Marden

GOOD HUNTING STILL, IN THE "LAND OF THE TURKEY AND THE DEER"

Thus the Maya of old called their domain in the Yucatán Peninsula, Mexico. The smiling hunter, holding a gorgeous ocellated turkey and wearing the customary apronlike cloth over his breeches, is a descendant of the mighty builders of Chichen Itzá, holy city of the Maya. Its patron deity was Kukulcan, the Feathered Serpent (Plates X, XI, XVI). Ruins of magnificent pyramids, palaces, and temples abandoned about 500 years ago have been excavated and restored by the Carnegie Institution of Washington, D. C., and the Mexican Government. The author describes the Institution's work there, which he has directed since its beginning in 1924.

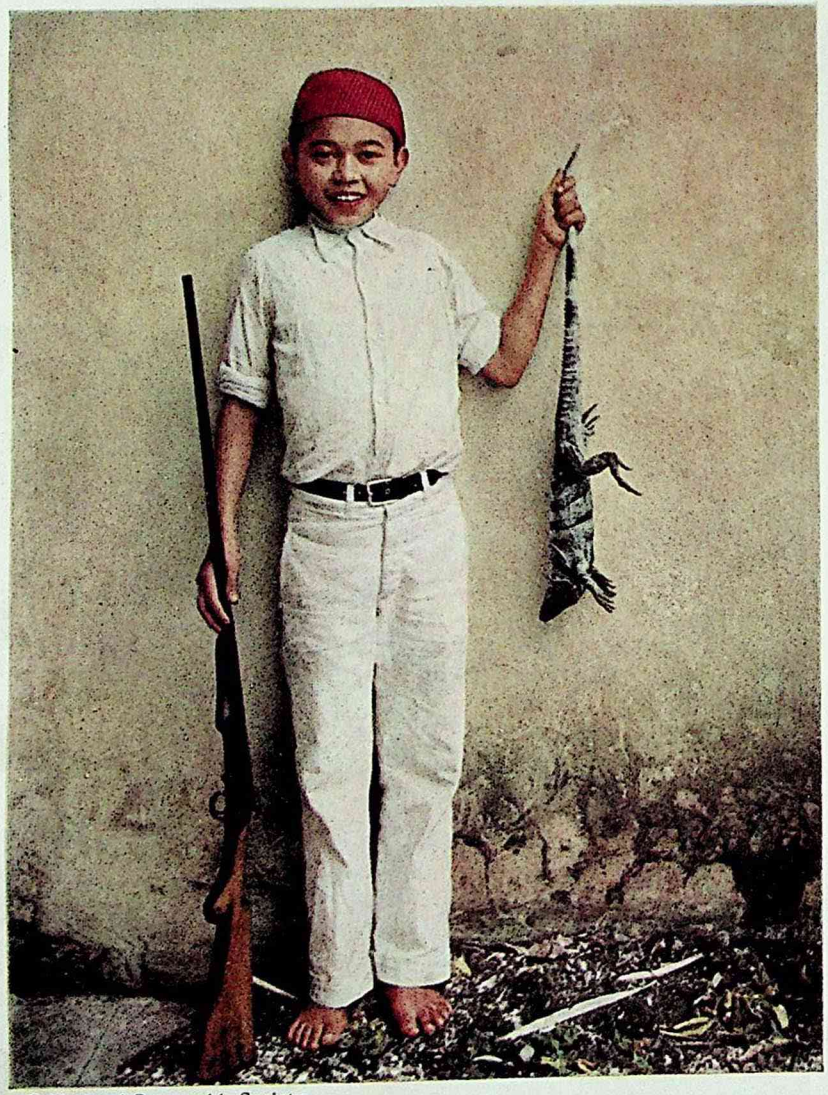


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AMATEUR TOREADORS PARADE INTO AN IMPROVISED BULL RING OVERFLOWING WITH FIESTA CROWDS

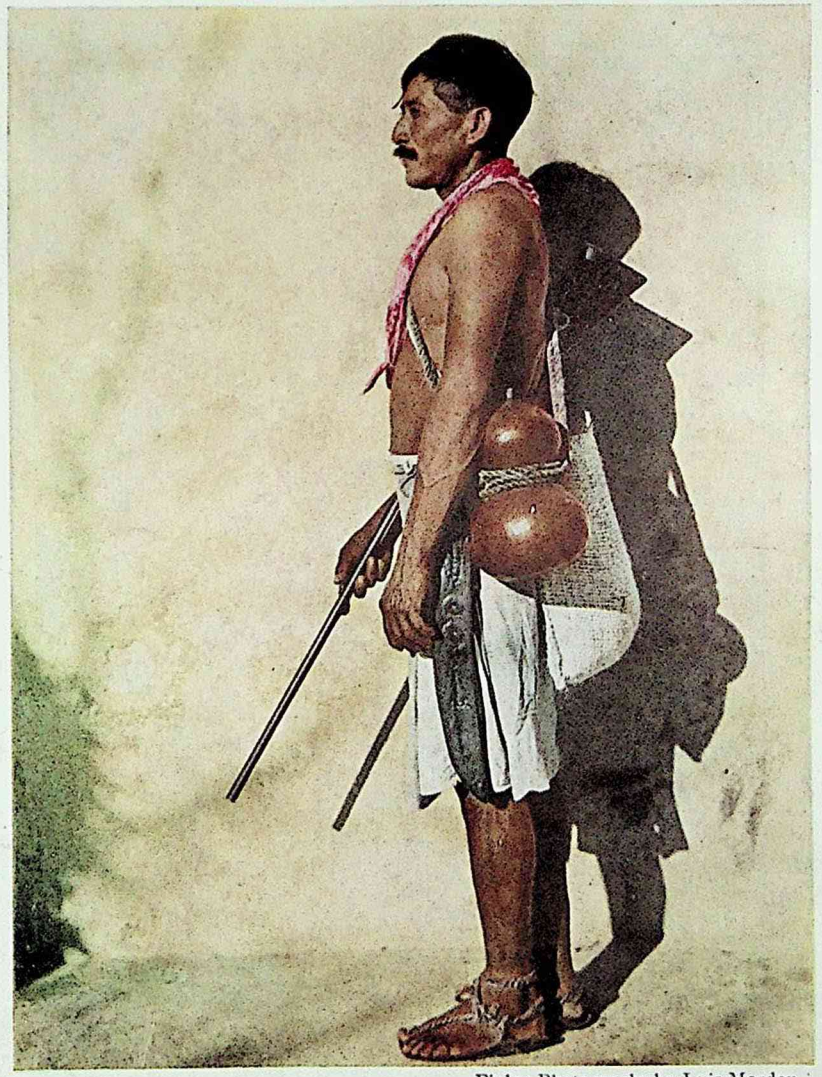
The bull, now roped by the horns to a stake, will be goaded to action by a string of firecrackers tied round the body and set off the moment he is released. As soon as the matador, right foreground, dispatches the bull, the carcass will be cut up and sold as meat. This temporary ring occupies the main square of Dzitás, a village near Chichen Itzá. Behind it is the thatched roof of a large Maya house (Plate IV).



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"LITTLE MONKEY" BAGS AN IGUANA

He can bring down a lizard, bird, or opossum with nearly every shot —a valuable art in Yucatán, where ammunition is costly. Angel, nicknamed Tuchin (Little Monkey), is the son of a Maya woman and the Korean major-domo of the Carnegie Institution's hacienda at Chichen Itzá.



Finlay Photographs by Luis Marden

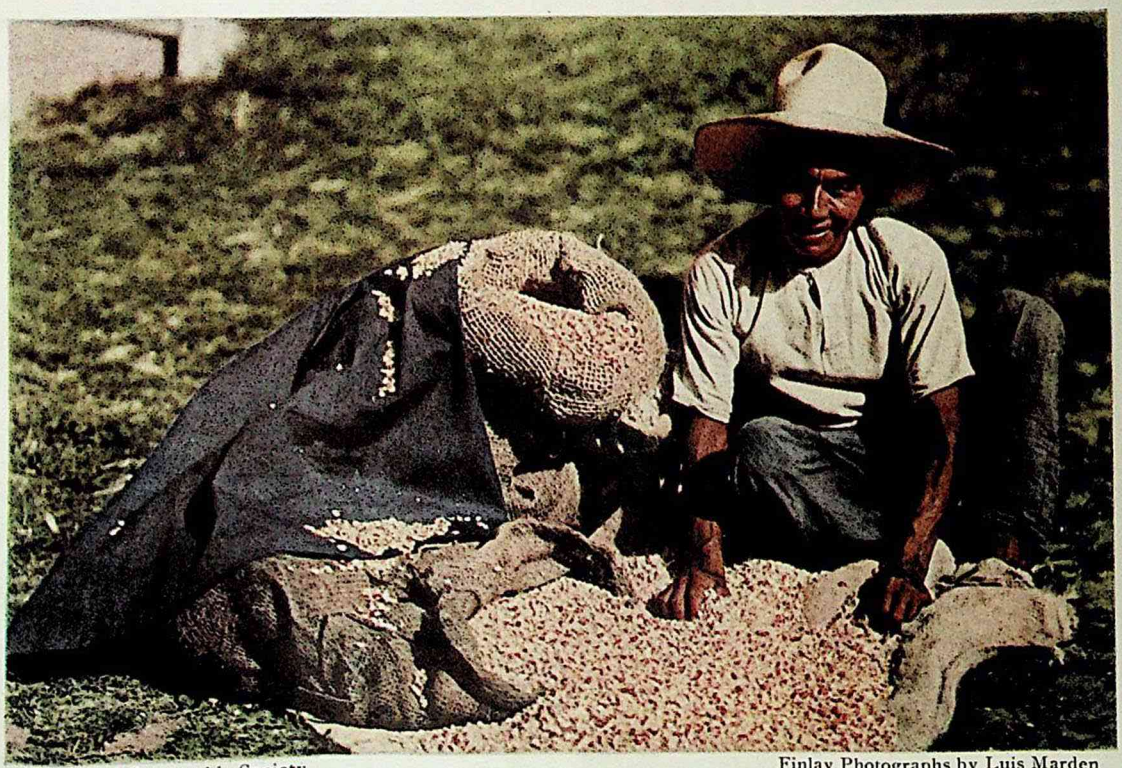
A MAYA HUNTER TRAVELS LIGHT

When the stalwart foreman of the Chichen Itzá excavation gang goes shooting in the bush, he needs only shotgun, water gourd, food bag made of henequen, and a broad-bladed machete imported from Connecticut. He is a fine Maya type, with well-shaped head.



LIKE THEIR ANCESTORS, THE MAYA OF TODAY BUILD OVAL, WINDOWLESS HOUSES

Murals in the Temple of the Jaguars at Chichen Itzá depict dwellings identical with this one of near-by Pisté. A framework of saplings, with a door in each long side, is plastered with mud and thatched with palm leaves or grass. Domestic animals share the single room.



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Finlay Photographs by Luis Marden

FROM 75 TO 85 PER CENT OF A MAYA INDIAN'S DIET IS CORN

It is eaten mainly in the form of tortillas (Plate VII), of which the average native consumes about 20 at a meal. A sick person explains his state of health by saying: "I ate only one or two tortillas this morning." In ancient times, the Corn God was a principal Maya deity.



USING A HOOKED KNIFE AS "BOTTLE OPENER," HE WHITTLES A COCONUT TO GET A DRINK

The milk of the green fruit is safe as well as refreshing, and wherever coconut trees have been planted in Yucatán, they prove a boon to the traveler. The sharp, curved knife is used for many purposes, such as harvesting corn and cutting wood (Plate VI).



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Finlay Photographs by Luis Marden

PAPAYAS FIT FOR A GIANT'S BREAKFAST GROW AT CHICHEN ITZÁ

Fresh from the tree in the hacienda gardens, the fruit under the Indian's arm weighs 19 pounds and is about two feet long. Papayas resemble melons, but are not so sweet or strongly flavored as a cantaloupe. A favorite fruit in their native tropical America, they flourish also in southern Florida.



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THIS MAYA WOOD CARRIER USES HIS HEAD

The tumpline across his forehead is made of henequen. Many of the Indians work on Yucatán's vast plantations, which export about fifty per cent of the world's supply of this fiber, used in making binder twine and rope. The hooked knife is a chopping and cutting tool.



Finlay Photographs by Luis Marden

A SCARLET HIBISCUS FOR THE RISING GENERATION

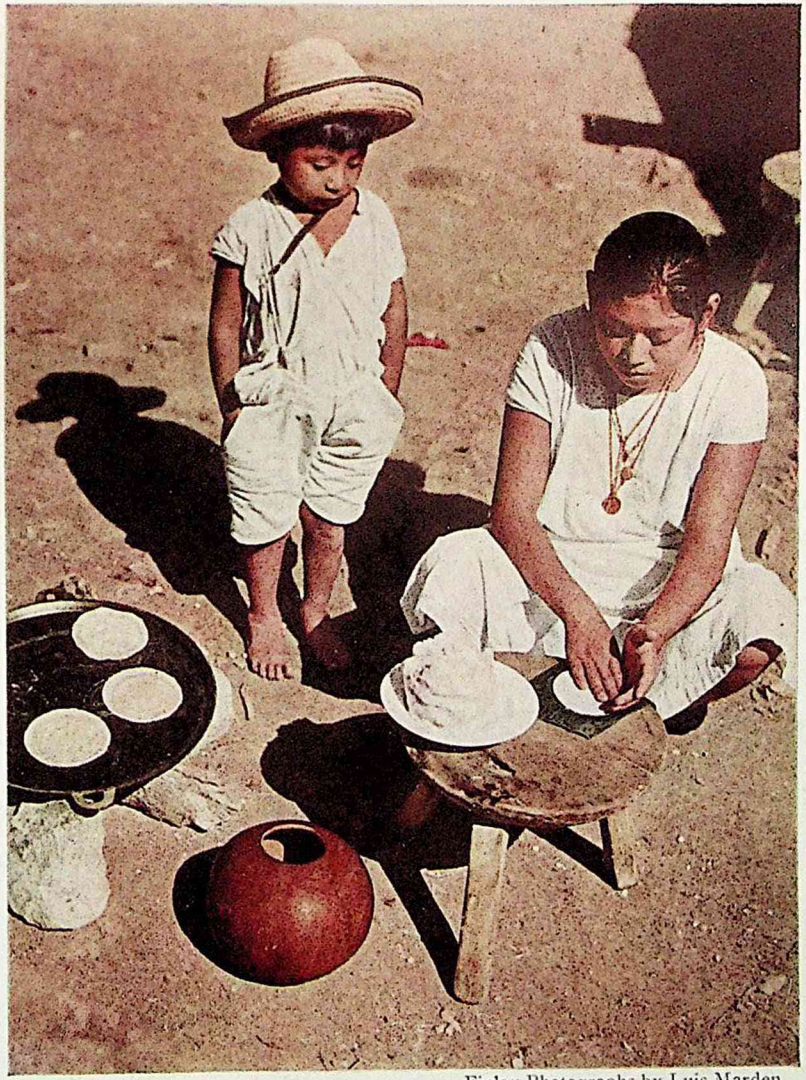
No less showy than the real blossom are the embroidered designs on the women's spotless "Mother Hubbards." Long petticoats, sometimes edged with lace, are part of the usual Maya costume, which on feast days may include earrings and high-heeled shoes.



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A HOUSEWIFE GRINDS CORN THE AGE-OLD WAY

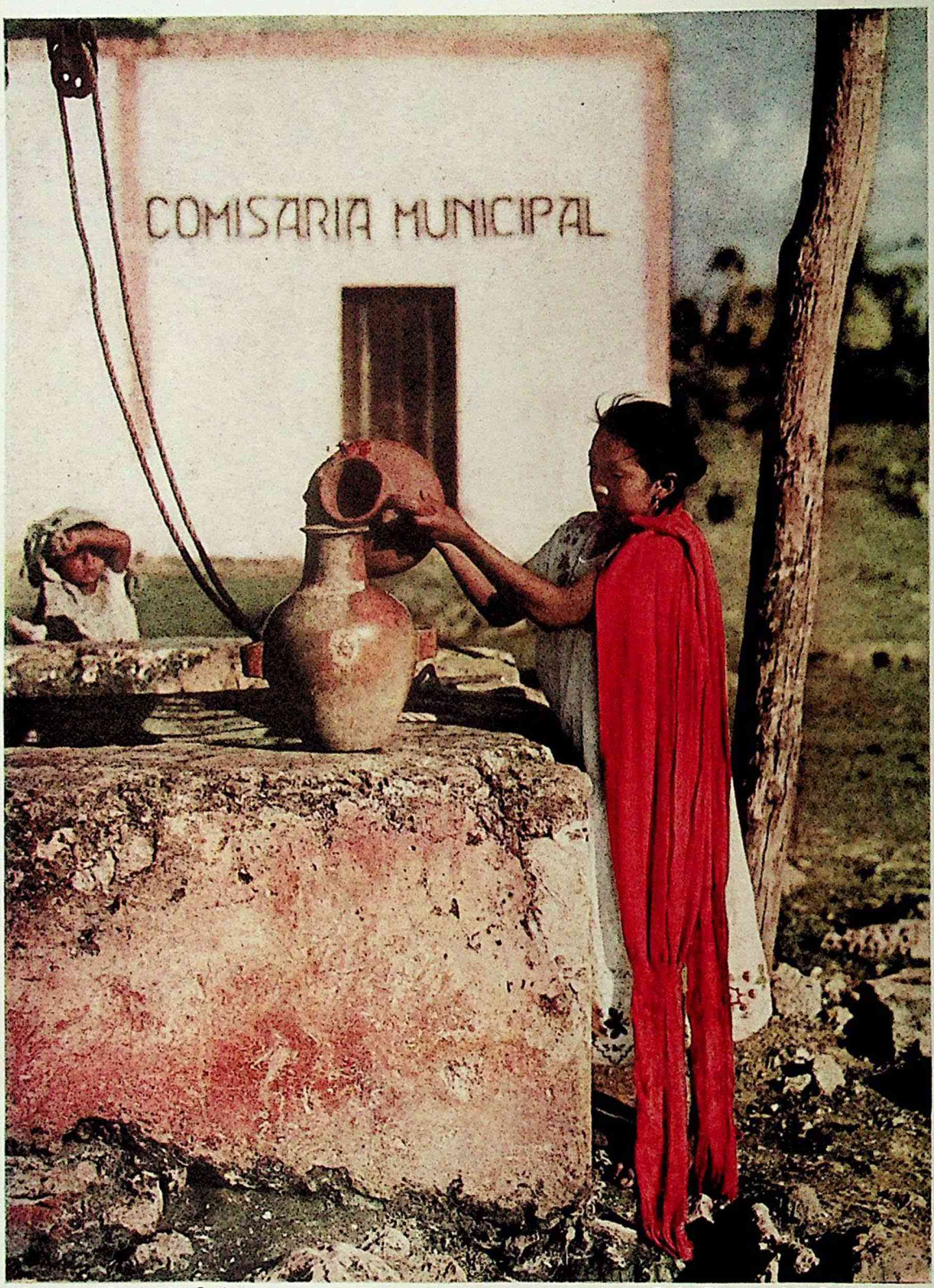
She pushes the stone roller over maize on the stone and moistens the meal to make paste for tortillas. Modern grinders are displacing this method. The Maya civilization was based on corn (Plate XXIV).



Finlay Photographs by Luis Marden

TORTILLA MAKING IS WOMAN'S WORK

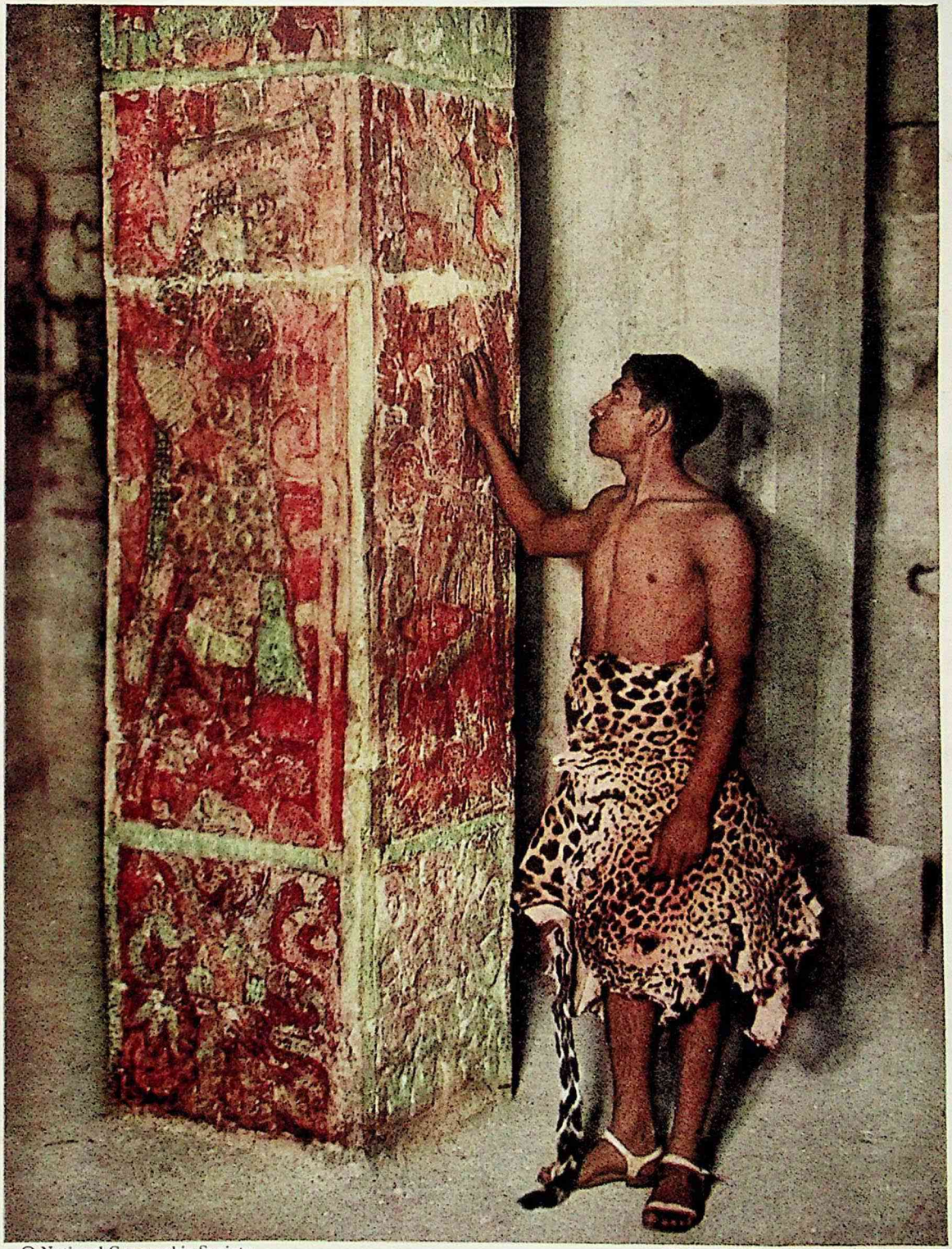
But the youngster seems interested as his mother deftly shapes the dough on a piece of banana leaf. She bakes the flat, round cakes on an iron pan over an open fire, then puts them in the hollow gourd, ready to serve.



© National Geographic Society Finlay Photograph by Luis Marden

IN GAY SCARF AND FLOWERED GOWN, A MAYA MATRON FILLS HER FAMILY WATER JAR

From time immemorial, the women and girls of Yucatán have come with jars on heads or hips, in the morning and again before sundown, to draw water at the village wells, where they gossip and order the community's affairs like housewives in old-fashioned sewing circles. The sign on the "Municipal Commissary" is in Spanish, but many Maya speak only their native tongue.



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Finlay Photograph by Luis Marden

A MAYA "TARZAN" INSPECTS A COLUMN HIS ANCESTORS PAINTED CENTURIES AGO

Its brilliant colors would have faded long since, had not this Temple of the Chac Mool been filled in and buried as part of the foundation for the later Temple of the Warriors (Plate XV). Each face of the limestone column bears the carved figure of a god or warrior, covered with fine white plaster and painted. A jaguar skin such as the youth wears for the camera was often part of the costume of the ancient Maya, to whom the animal symbolized bravery.

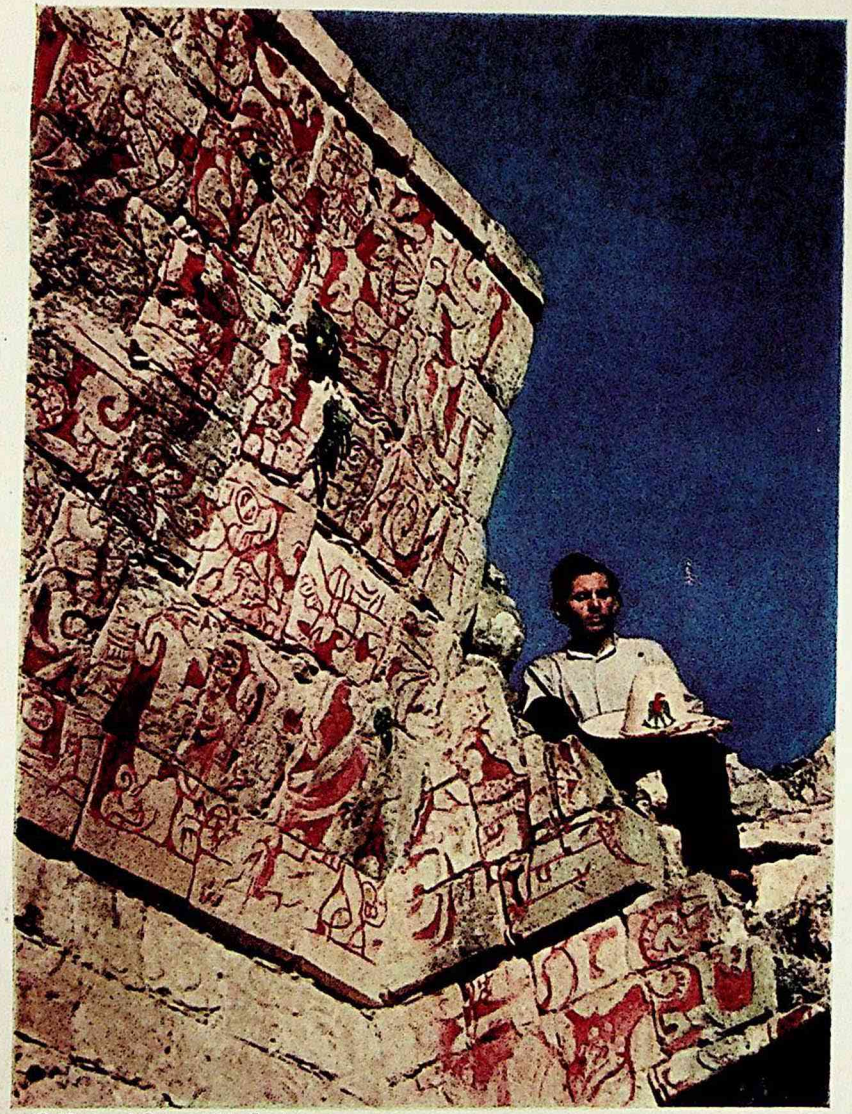


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CEREMONIES OF BARBARIC SPLENDOR TOOK PLACE AT CHICHEN ITZÁ'S CHIEF SANCTUARY, CALLED "EL CASTILLO" BY SPANIARDS

Priests in gorgeous feather cloaks and jaguar skins probably led Maya maidens as sacrificial victims down the main stairway, right, and out along the Sacred Causeway to the Well of Sacrifice a quarter-mile distant (Plates XVI and XVII). Largest building in the city, the terraced limestone pyramid covers nearly an acre and was dedicated to Kukulcan, the Feathered Serpent. At the base of the reconstructed stairway gape two giant serpent heads.



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RESTORING THIS VAULT WAS LIKE DOING A JIGSAW PUZZLE

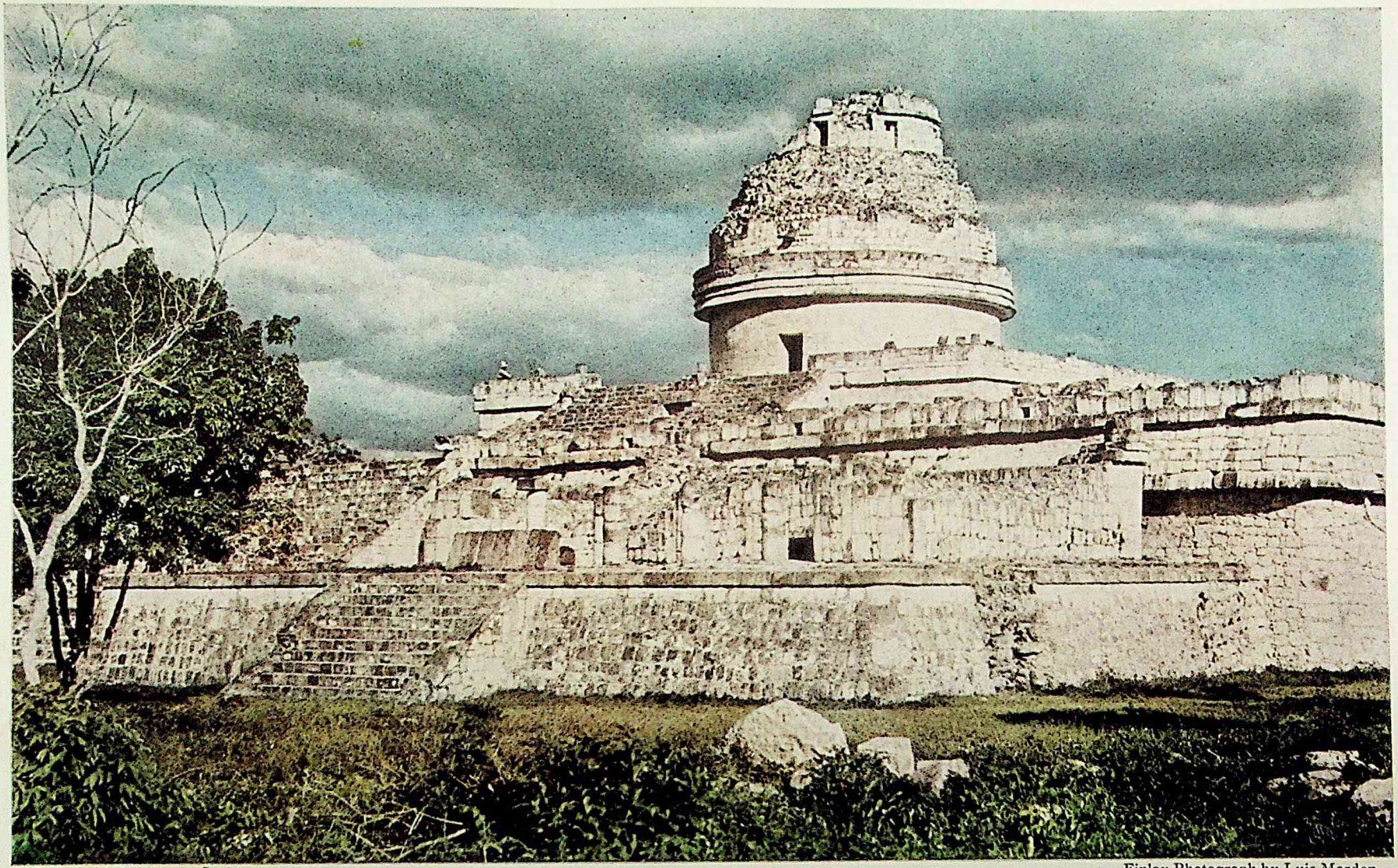
The sculptures of warriors and other figures were only a jumbled heap of fallen stones. Mexican archeologists blocked out the background in red, so they could follow the design and fit the pieces together.



Finlay Photographs by Luis Marden

A FEATHERED SERPENT STANDS ON ITS HEAD

The open-jawed monster, a favorite Maya design, forms a column in the Temple of the Warriors (Plate XV). Now that the roof is gone, the overhanging tail, with rattles, is bolted to the body to keep it from falling.

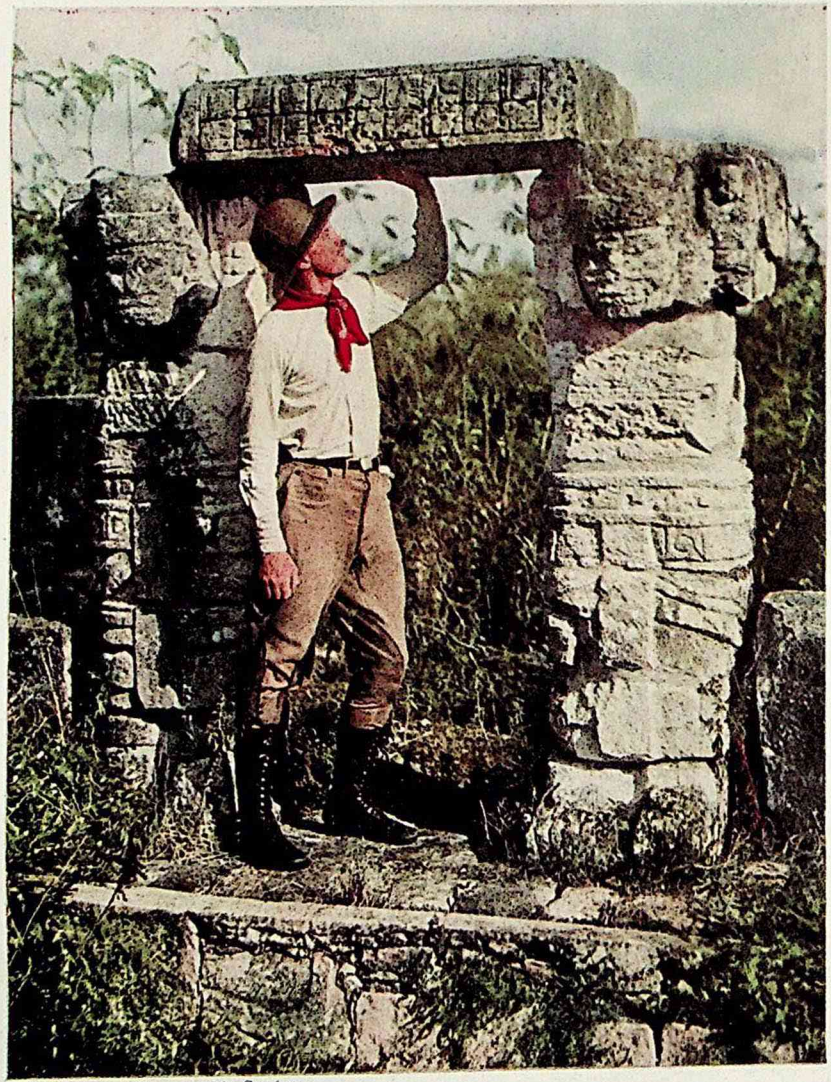


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Finlay Photograph by Luis Marden

"GREEKS OF THE NEW WORLD" BUILT THIS ASTRONOMICAL OBSERVATORY AT CHICHEN ITZÁ

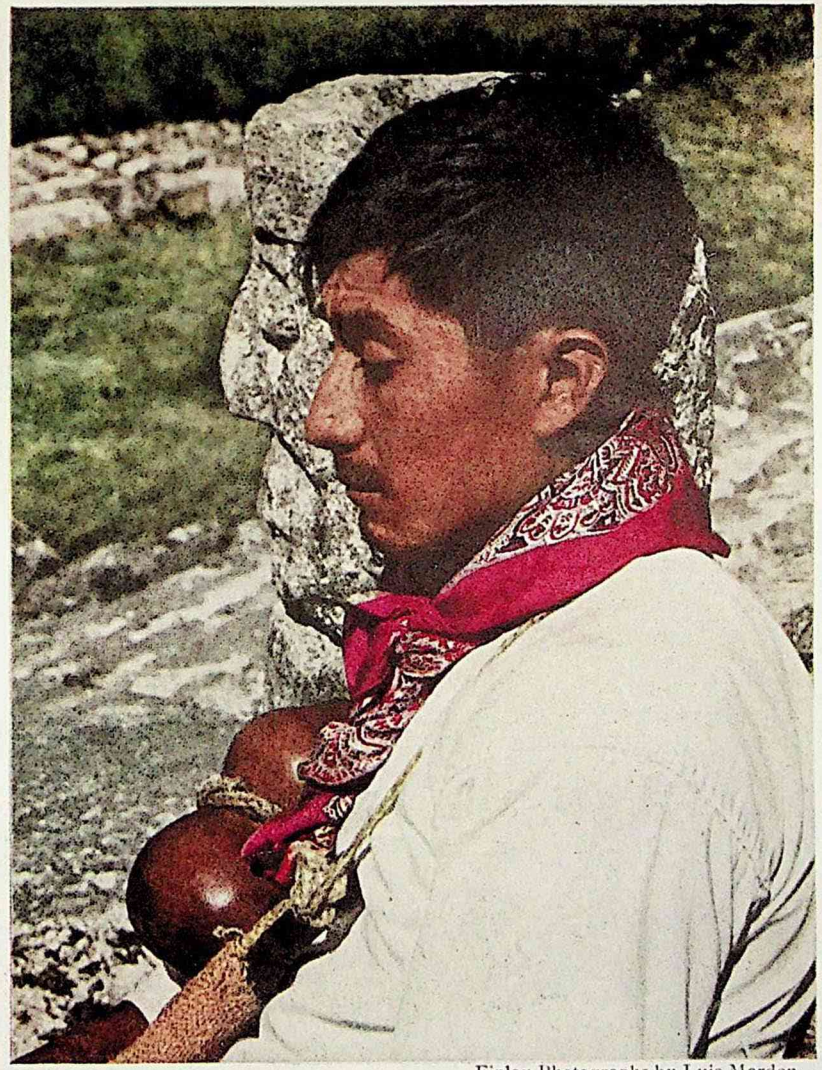
Spaniards named the Maya structure "El Caracol," from the resemblance of its interior spiral stairway to the whorl of a snail shell. Astronomers took observations through the windows near the top along definite "lines of sight." For example, the line of sight formed by the inner north jamb with the outer south jamb of the left-hand window bisects the sun as it sets on March 21, the vernal equinox (Color Plate XX).



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A DOORWAY BUILT 600 YEARS BEFORE COLUMBUS CAME

Between sphinxlike faces flanking the entrance of a little ruined temple, a scientist studies the stone lintel, where hieroglyphics on the front show that the edifice was dedicated about A. D. 876. An extraordinarily accurate calendar was perfected by the ancient Maya.



Finlay Photographs by Luis Marden

A GRAVEN IMAGE COMES TO LIFE!

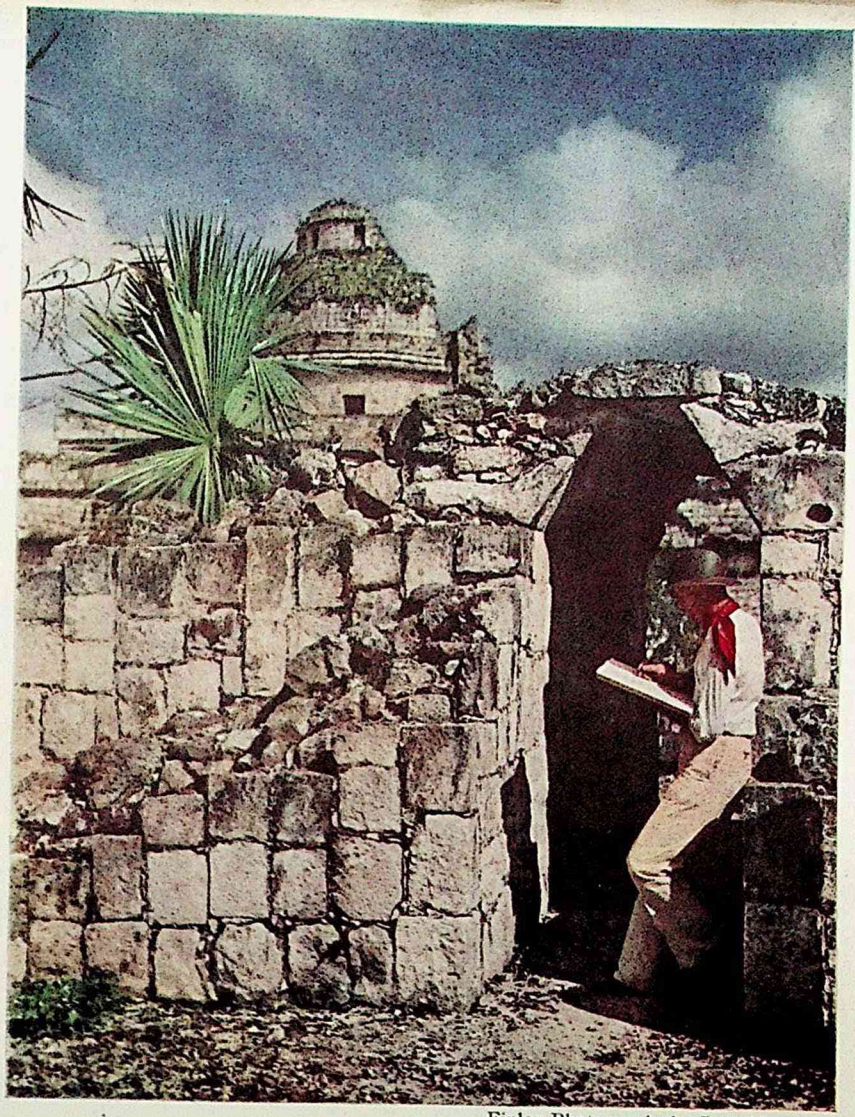
Posed beside a hollowed stone fire pot or incense burner on the Caracol (opposite plate), this modern Maya in profile shows that his race has retained the strong aquiline nose, drooping eyelids, and rounded head that old sculptures depict.



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THIS LAD KNOWS LITTLE OF HIS RACE'S BYGONE GLORY

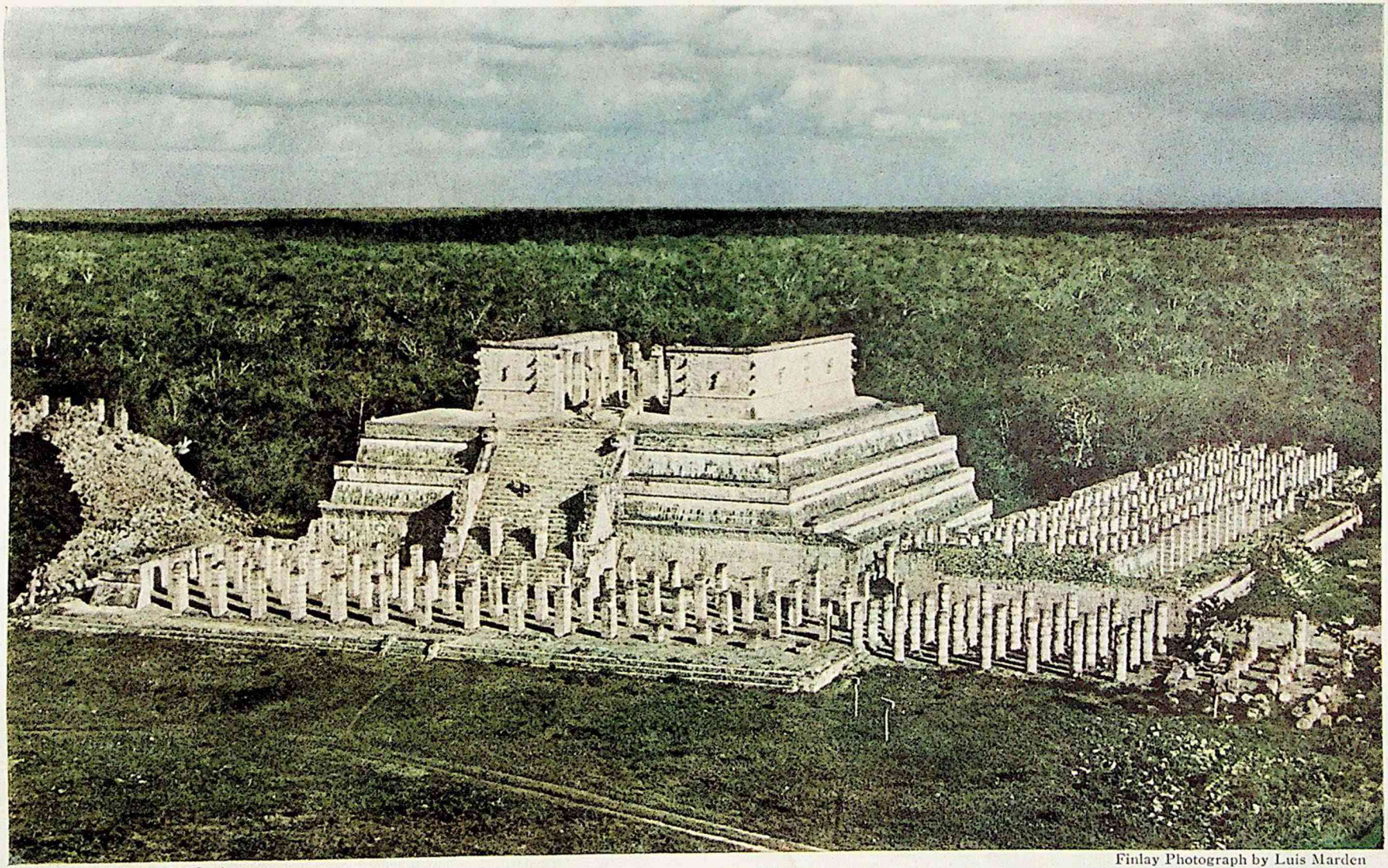
To a present-day Maya, the reliefs sculptured by his ancestors on the Temple of the Wall Panels would be virtually meaningless unless explained by an archeologist. Men, jaguars, monkeys, and thatched houses are depicted on the blocks.



Finlay Photographs by Luis Marden

A MAYA "ARCH" HAS NO KEYSTONE

This arcade in a temple beside the Caracol was formed by extending the side walls inward until they almost converged; then a flat capstone was laid across them. Roofs of temple colonnades constructed in this manner have all fallen in ruins.

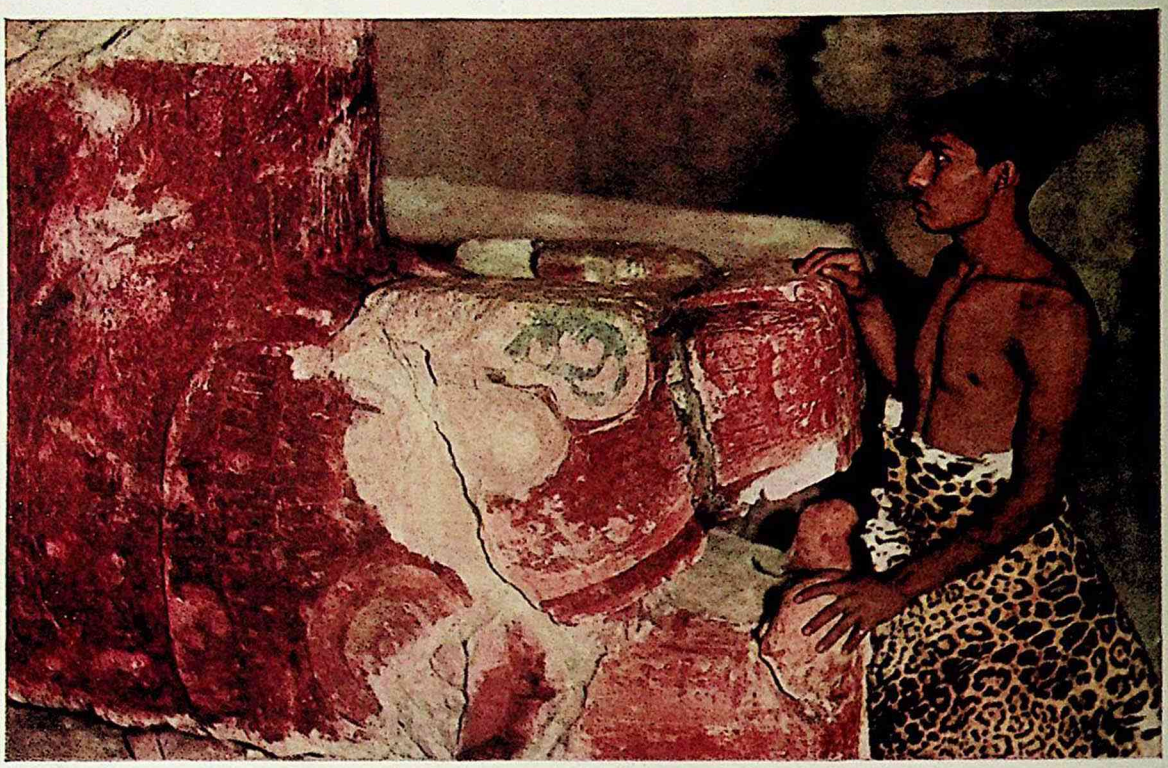


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Finlay Photograph by Luis Marden

FOUR YEARS OF DIGGING AND REBUILDING HAVE REVEALED MUCH OF THE TEMPLE OF THE WARRIORS' FORMER GRANDEUR

This pyramid-sanctuary and colonnade at Chichen Itzá was nothing but a mound, covered with stones and overgrown with trees and bushes, when the Carnegie Institution commenced work on it in 1925. Archeologists named the now roofless building after the sculptures of fighting men found on the pillars. Beyond the temple stretches the bush which covers much of level Yucatán. An automobile road runs from Mérida, capital of the State, to the ancient Itzá metropolis, where a modern hotel accommodates the numerous visitors to the ruins.



A SINGLE PIECE OF STONE FORMS THIS FEATHERED SERPENT'S HEAD

It is the base of one of two columns which originally flanked the principal portal of the buried Temple of the Chac Mool (Plate IX). America's habit of chewing gum is responsible for the finding of many Maya cities, for chicle hunters were among the first to report ruins.



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THE WELL OF SACRIFICE HOLDS NO TERRORS FOR A MAYA OF TODAY

A few centuries ago this girl might have been among the beauties cast from the stone platform, right, into the forbidding green water (Plate XVII). The round stone supported the dredging equipment of an American archeologist, who retrieved skeletons and sacrificial treasure from the well.

weeds a third year in the same field. Thus most of the total area available for cultivation must have been lying fallow in ancient times, when the population was much denser than it is today, awaiting reforestation, so that it could be cleared and burned again.

Today, depending upon the natural fertility of the region, this process of reforestation takes from three to ten years.

The second drawback to this agronomic system, which has been called *milpa* agriculture, after the Aztec word for cornfield, is even more serious than the first, though its ill effects are not so immediately apparent. If these repeated burnings are continued long enough, a point is eventually reached where the process of reforestation is retarded, and instead of woody growth returning to the abandoned cornfields, they become overgrown with grass. When this stage was reached, agriculture, as practiced by the ancient Maya, was at an end.

LACK MODERN FARM IMPLEMENTS

Even today the modern Maya have no way of turning the stony soil, everywhere interspersed with outcroppings of the native limestone. They have no hoes, picks, harrows, shovels, spades, or plows. Indeed, the ground is so rocky that no attempt is made to turn it and their only agricultural implements are the ax, the *machete,* or cutlass, with which they fell the forest, and the wooden planting stick with which they make holes in the ground and plant the corn. Their ancestors had only the stone ax and planting stick.

In ancient times the trees were killed by cutting a ring around the bark with a stone ax, and when they had dried out they were burned standing.

I believe that by the eighth century, after perhaps a thousand years of intensive occupation, the Old Empire region had been gradually transformed from a heavily forested area to vast man-made savannas. The forests were replaced by grass lands, and agriculture, as practiced by the Maya, was at an end.

This naturally did not take place all at once, but slowly, the forest gradually retreating before the advancing savannas.

The ancient Maya priests surely must have foreseen what was impending and many, if not most, of the religious ceremonies toward the end of the Old Empire were doubtless special appeals to the gods to send more abundant crops.

The archeologic evidence, however, indicates that the Maya deities did not hearken to these prayers.*

THE MAYA REACH YUCATÁN

Long before affairs had reached this crisis in the south, however, parties of Maya had been pushing northward into the Peninsula of Yucatán. One of the early Spanish chroniclers, Father Bernardo de Lizana, writing at the end of the 16th century, mentions a tradition that the pioneer entry into Yucatán by the Maya was from the east and that at first only a few people came, for which reason this first Maya immigration was called the *Cenial,* or "Little Descent." Later many people came from the west, which movement was called the *Nohenial,* or "Great Descent."

In Lizana's time these two words were used metaphorically for east and west, respectively, instead of the usual Maya words, *likin* and *chikin.*

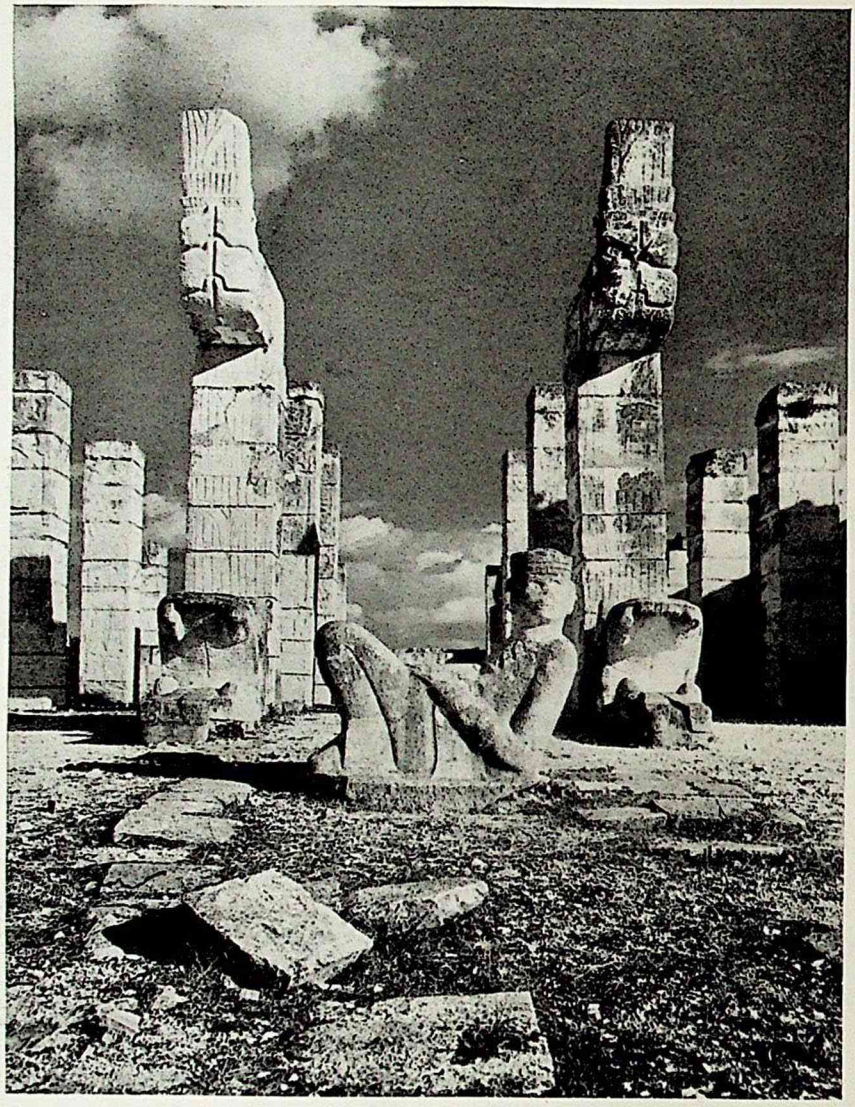
If we substitute "southeast" for "east" and "southwest" for "west" in Father Lizana's statement, we shall find that this tradition agrees with the archeologic evidence. For there is a chain of dated cities extending from northeastern Petén up the east coast of the peninsula and thence inland (Ichpaatun, Tulum, Cobá, and Chichen Itzá) and another up the west side of the peninsula (Santa Rosa Xtampak, Etzna, Holactun, and Jaina).

Moreover, the eastern cities, with one exception, all have earlier dates than the western ones.

The first Maya probably reached Yucatán from the southeast, but there is strong, indirect archeologic evidence that they found an earlier people already settled there who may or may not have spoken the Maya language, but who certainly did not have Maya culture. They had no stone architecture, no chronology or calendar, no hieroglyphic writing and no typical Old Empire pottery.

And herein lies the archeological catch. If the Maya had found no previous occupants of the region, the pottery they made after reaching Yucatán would have been the same, given minor variations due to local differences in clay, as they had made in their former homes in the south.

* I have recently told the story of the Old Empire civilization and the cause of its fall in a "Guide Book to the Ruins of Quirigua," published by the Carnegie Institution of Washington, D. C.



"THE FEATHERED SERPENT" GUARDS THE TEMPLE OF THE WARRIORS

The two high columns, flanking the central doorway, are representations of the Maya god Kukulcan, patron deity of Chichen Itzá. The heads with widely opened mouths lie on the ground and the tails above terminate with tufts of feathers. The reclining human figure in front holds on its belly a flat disk where offerings were placed by the faithful before entering the building. This ruin was excavated in 1925-1928.

But such is not the case. H. B. Roberts, the Carnegie Institution's expert on Maya ceramics, finds that the pottery used throughout Yucatán in New Empire times is entirely different from that used in the Old Empire region from whence they came.

The easiest explanation for this apparent archeologic paradox is that a distinctive indigenous ceramic art had already been developed by previous inhabitants of Yucatán before the arrival of the Maya cultural complex. The bearers of the Maya tradition simply took over native styles of pottery—much the easiest thing to do—but imposed the other elements of their own culture, such as the architecture, art, calendar, and hieroglyphic writing, on the earlier inhabitants of the region.

THE MAYA RENAISSANCE AND THE LEAGUE OF MAYAPAN

Chichen Itzá, in northeastern Yucatán, later destined to become the most holy city of the New Empire, seems to have been founded toward the end of the seventh century, and Uxmal and Mayapan, other important cities of the north, somewhat later, perhaps by the end of the tenth century.

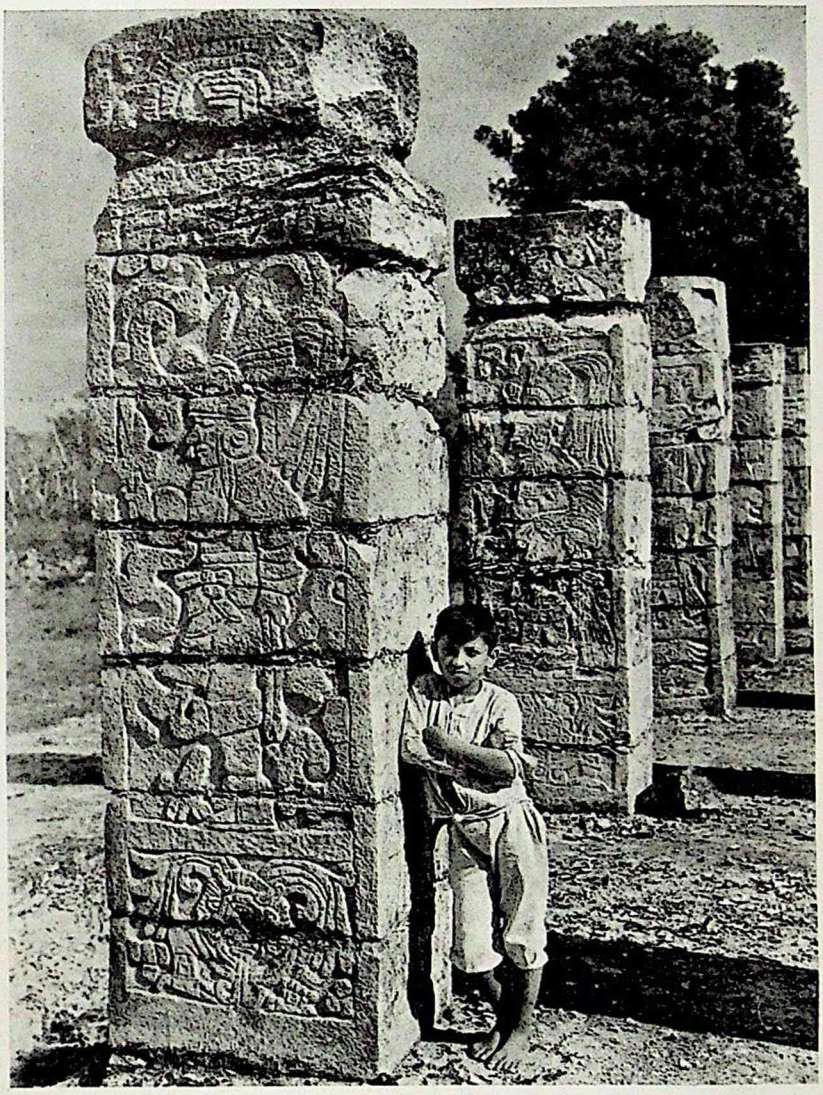
The earliest period of the former possibly goes back to the "Lesser Descent," the two latter to the "Greater Descent."

Early in the 11th century the three most important city-states of northern Yucatán, Chichen Itzá, Uxmal, and Mayapan, established a confederacy called the League of Mayapan, under which the country was divided into three spheres of influence, one of these three city-states being pre-eminent in each.

Under the peaceful conditions which followed, the Maya civilization blossomed anew, the arts revived, and architecture flourished as never before, not even in the

heyday of the Old Empire.

The façades of the New Empire buildings, instead of being decorated with stucco, were elaborately sculptured with geometric designs, mask panels of the Rain God and other decorative elements, and brilliantly painted, while sculpture as an independent art seems to have languished. being used chiefly as an adjunct to architecture. The Maya were at peace, the country prospered under wise leaders, and a true Renaissance flowered and endured for two centuries.



RELIEFS SHOW HUNDREDS OF WARRIORS, NO TWO ALIKE

Each of the four sides of these rectangular columns in the northwest colonnade at Chichen Itzá is carved to represent a fighter in full regalia. Originally the eyes of these figures were exceedingly lifelike, for they were made of incrustations of white shell with small circles of black pitch or resin to form the pupils. Finally, as in all other Maya sculptures, the relief was painted in a variety of bright colors: red, blue, green, yellow, brown, and also black and white.

THE MEXICAN PERIOD

Toward the end of the 12th century the League of Mayapan was disrupted by a fierce quarrel between the rulers of Chichen Itzá and Mayapan. Uxmal, standing on the side lines, watched her former allies fight it out.

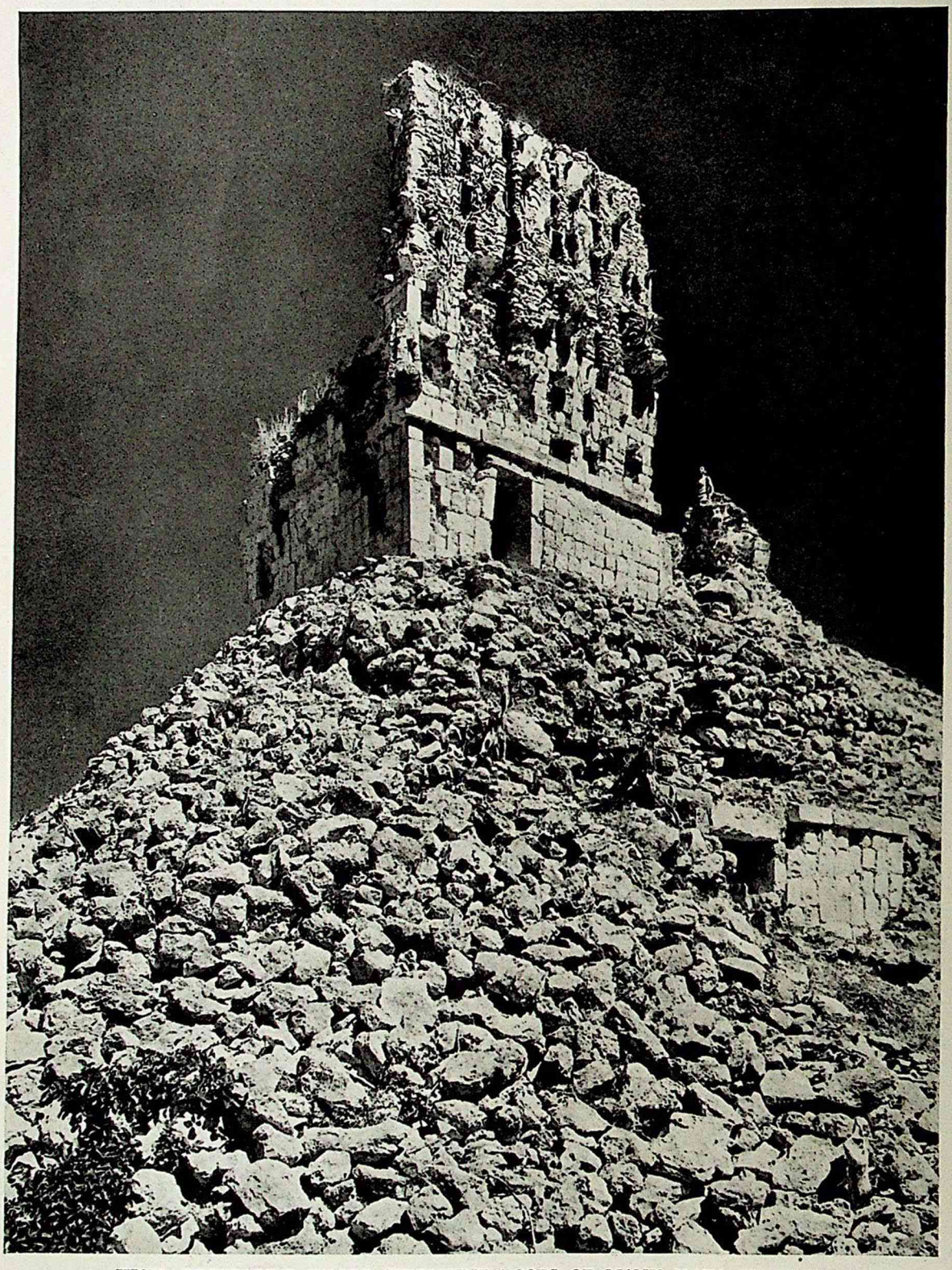
The "True Man" of Mayapan, as the ancient Maya called their ruler, Hunnac Ceel (Plate XXII), finding himself hard pressed in the ensuing war, brought over foreign allies from the interior of Mexico.

These were not Aztecs, nor perhaps even Toltecs, who preceded the Aztecs in the central Mexican highlands, but more probably a closely allied people speaking a dialect of the same language as that of the Aztecs, namely, Nahuatl.

With the aid of his Mexican allies, who possibly introduced the bow and arrow into Yucatán, which in turn may have been partly responsible for the victory which followed, Hunnac Ceel defeated Chac Xib Chac, the ruler of Chichen Itzá.

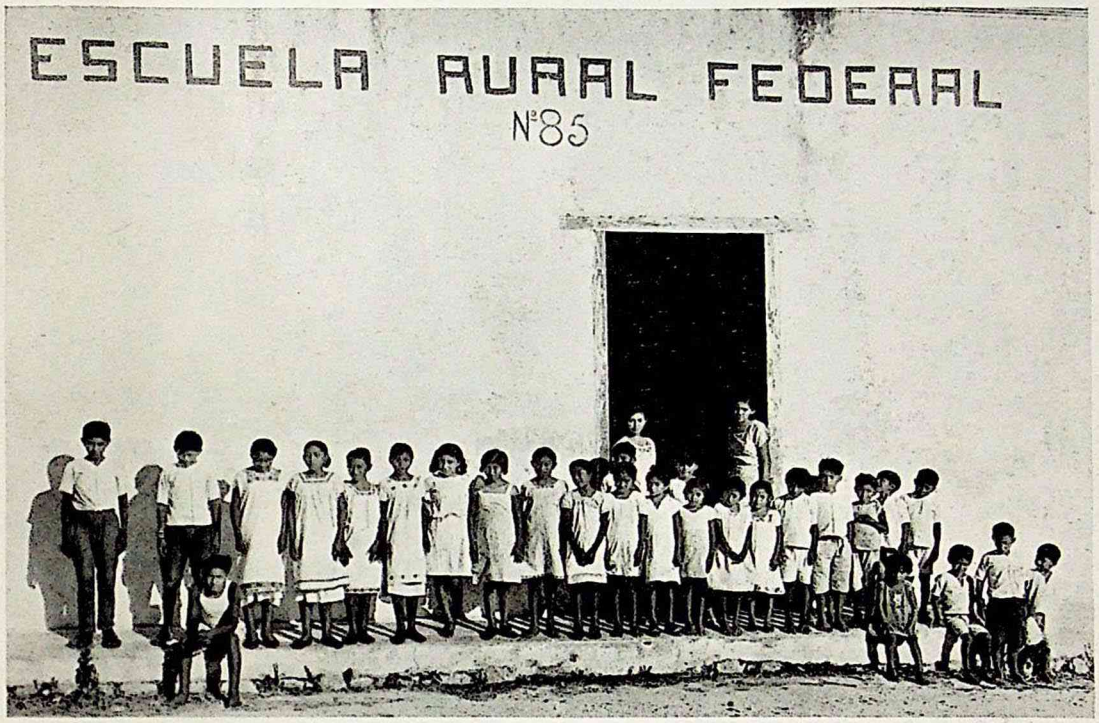
Though the fragmentary pre-Spanish chronicles are silent on the point, it appears highly probable, nevertheless, that Chichen Itzá was given to the Mexican allies as their share in the spoils of war.

During the closing period of Chichen Itzá's history (the 13th, 14th, and first half of the 15th centuries), the city fell under a strong Mexican influence, clearly reflected in its art and architecture.



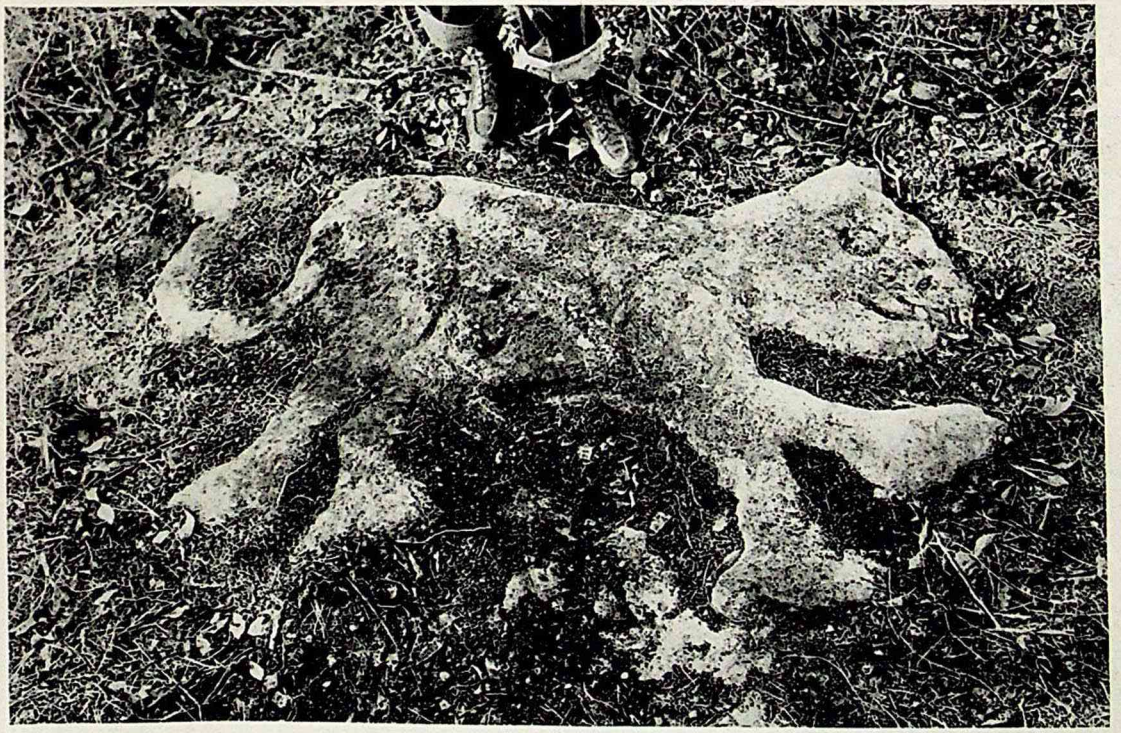
HIGH, DECORATIVE WALLS SURMOUNT ROOFS OF MANY MAYA TEMPLES

These superstructures, sometimes towering 30 feet, were purely decorative. They were used as the framework to support an elaborate design worked out in stucco, which in most cases has been destroyed. A few examples, however, are still fairly well preserved and these indicate the character of the relief formerly presented on them: figures of gods, rulers, animals, and masks.



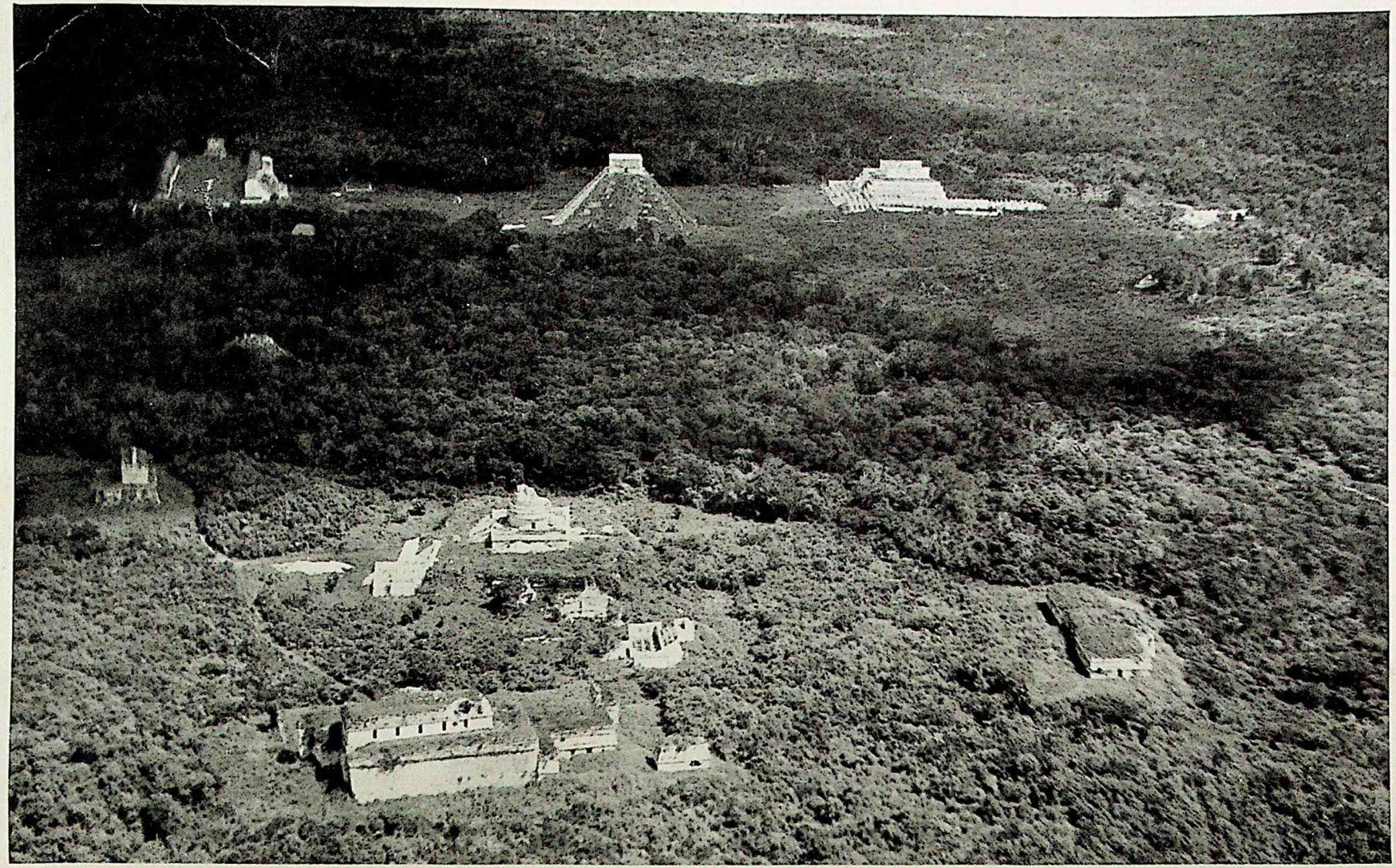
THE THREE R'S REACH COUNTRY VILLAGES

Schools in Yucatán are of three kinds: some Federal; others State, and a few private. This one at Pisté, two miles from the ruins of Chichen Itzá, is a Federal school.



A JAGUAR FIGURE ADORNS A LIMESTONE OUTCROP NEAR THE HACIENDA AT CHICHEN ITZÁ

Representations of this animal were important in Maya symbolism. Capes, breechclouts, and headdresses made of jaguar skins are frequently portrayed in reliefs and wall paintings, as also double- or single-headed jaguar thrones.



Photograph by Colonel and Mrs. Charles A. Lindbergh

THE LINDBERGHS OBSERVED CHICHEN ITZÁ FROM THE AIR

The famous aviators made a series of flights in October, 1929, exploring the eastern part of the Yucatán Peninsula. The aerial surveys were sponsored by the Carnegie Institution of Washington and the Pan American Airways. Dr. A. V. Kidder and Dr. O. G. Ricketson, Jr., of the Carnegie staff, accompanied the flyers. Photographs were made of ruined cities; this shows the New Empire site of Chichen Itzá, with the Monastery in the foreground, and the principal temple in the center background.



PRIESTS OF THE TEMPLE "THE HOUSE OF THE MAGICIAN" AT UXMAL (RIGHT) PROBABLY LIVED IN THE MANY CELL-LIKE CHAMBERS (LEFT)



THE THREE-STORY PALACE AT SAYIL CONTAINS 100 CHAMBERS

As in the majority of structures by the ancient Maya architects, who seem to have distrusted the weight-supporting properties of their typical corbel-arched roofs, the two higher stories were set back, being built on solid foundations rather than directly over the rooms beneath. Because the prevailing winds and rains in Yucatán are from the east, the right half of this building (the eastern half) has suffered more than the left.

As a result of the breaking up of the League of Mayapan, Chichen Itzá seems to have acquired a new and non-Maya dynasty, which introduced a new religion, a new art, a new architecture, and many new customs and ideas. Because it presents a blending of the two most important native cultures of North America, the Maya and the Aztec, Chichen Itzá was selected by the Carnegie Institution of Washington as a center for intensive explorations.

Excavations begun there in 1924 have continued ever since. Many imposing structures have been revealed and a flood of light thrown upon the life of the New Maya Empire (page 620).*

Chichen Itzá has an abundant water supply, which doubtless, from the beginning of man's occupation of Yucatán, predetermined that an important center of population should grow up there. The site is provided with two cenotes, each more than 200 feet in diameter, with the water level 90 feet below the ground.

The city takes its name from these two natural wells, Chichen Itzá meaning in Maya "The mouths of the wells of the Itzá."

One well, the Xtoloc Cenote, or Lizard Well, in the center of the city, had two masonry stairways descending its precipitous sides. The Xtoloc Cenote was used as the water supply of Chichen Itzá in ancient times, but the other cenote, at the northern end of the city, served a far more sinister purpose.

This was the Well of Sacrifice, and into its gloomy depths in times of great national necessity, such as drought, young maidens were hurled at daybreak as living sacrificial victims (Plates XVI and XVII).

The Spanish chronicles naïvely observe that if the girls managed to survive until midday, ropes were lowered to them and they were pulled out. Then they were questioned as to what the gods had told them was in store for the Itzá, whether an abundant year or famine. If the deities' reply indicated the former, there was great rejoicing, but if the latter, stones were hurled into the well and the people fled from the place with loud cries.

Not only were human sacrifices flung into this Well of Death but also the most highly prized possessions of the Itzá people: jade earplugs, noseplugs, beads, plaques and pendants, gold beads, bells, plaques and rings, copper bells and rings, carved bones, shells, elaborate weapons of wood, pottery, and masses of the sacred copal incense.

Some of this material was recovered thirty years ago by dredging, and now is on exhibition at the Peabody Museum of American Archeology and Ethnology, of Harvard University. Judging from the objects recovered, practically the entire cult of the Well of Sacrifice would seem to have been of Mexican rather than Mayan introduction at Chichen Itzá.

FEATHERED SERPENT THE PATRON DEITY

The patron deity of the city in late Mexican times was Kukulcan, the Feathered Serpent, a direct Maya translation of the Mexican deity, Quetzalcoatl, immortalized by General Lew Wallace in "The Fair God."

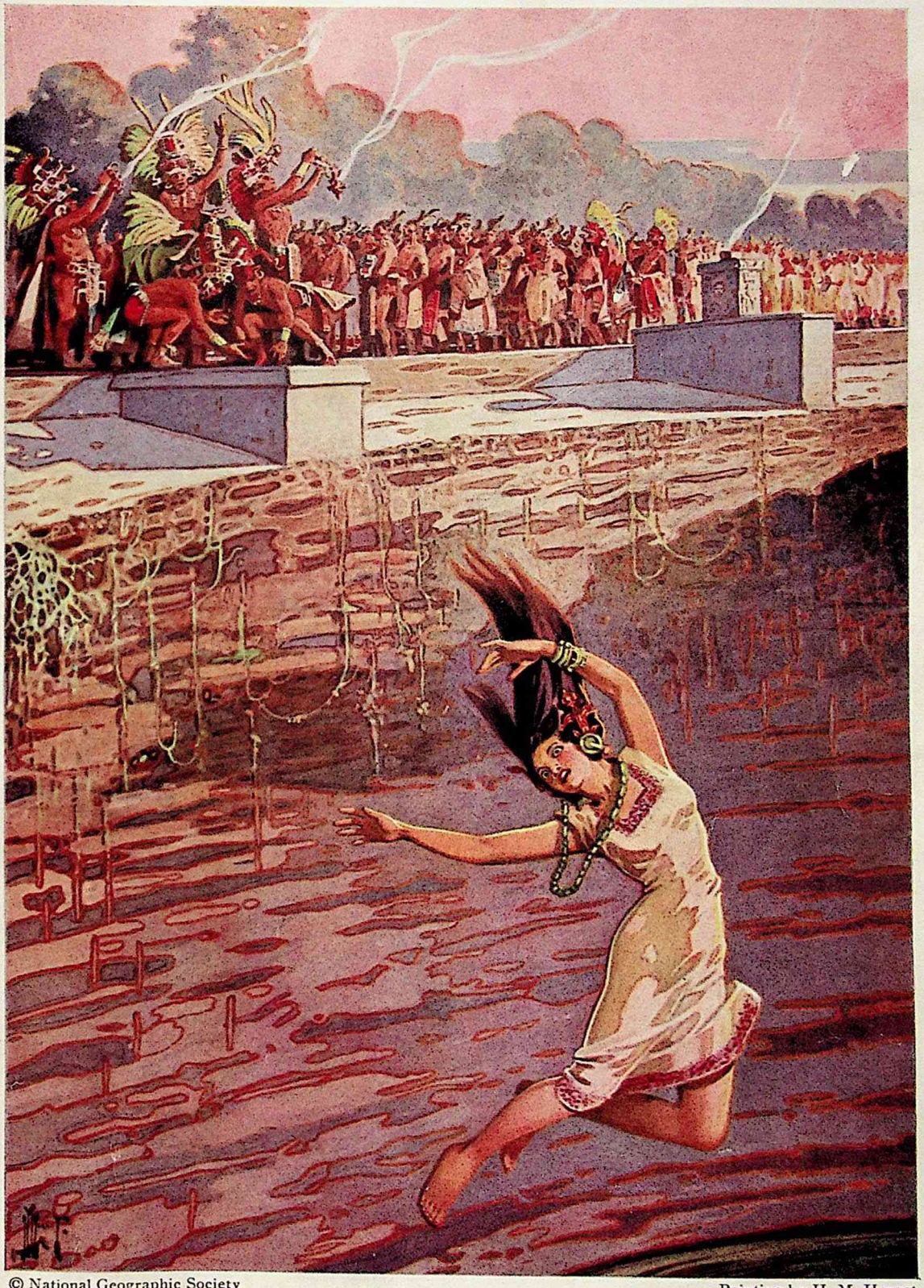
The feathered serpent columns, which guard the portals of so many of the temples at Chichen Itzá (page 616); the Atlantean column altars (page 596); the so-called "Chac Mool" statues of reclining human figures; the stone fretwork roof ornaments, the jaguar and eagle sculptures, the turquoise-crowned figures in the reliefs, and the exquisite turquoise mosaic plaques, of which four have been found at Chichen Itzá; even some of the hieroglyphics—all are Mexican importations.

Moreover, the ball game, though of Maya origin, as played at Chichen Itzá had a strong Mexican flavor (Plate XXIII). In fact, during the last two and a half centuries of the city's occupancy, Chichen Itzá, under the stimulus of its new rulers and the new religion they had introduced, with its spectacular rite of living human sacrifices hurled into the Sacred Well, became the most holy place in Yucatán, a center for pilgrimages from far and near.

During the 13th and 14th centuries, as a result of the fall of Chichen Itzá and the end of the League of Mayapan, the Cocoms, ruling house of Mayapan, became the leaders in the northern half of the Yucatán Peninsula.

By the clever expedient of compelling all the other Maya chieftains to reside at Mayapan, the Cocom capital, and to administer the affairs of their respective towns and villages through deputies, the successive Cocom rulers in effect held the other Maya chieftains in hostage while they

* See "Chichen Itzá, an Ancient American Mecca," in the NATIONAL GEOGRAPHIC MAGAZINE, January, 1925.



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Painting by H. M. Herget

A HUMAN SACRIFICE IS HURLED INTO THE SACRED WELL

Young girls were flung into the pit at daybreak in times of drought or other national crises to intercede with the gods in behalf of the Itzá tribe. If they survived the 80-foot plunge, they were hauled out at noon and questioned as to what the gods had in store. If the maidens failed to reappear, it was considered an evil omen; rocks were thrown into the well, and onlookers fled with loud lamentations. The sinister place is a natural hole in the limestone, 180 feet across (Plate XVI).



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Painting by H. M. Herget

BRONZED WARRIORS LOOK WITH STOLID PRIDE UPON A CITY THEIR FORBEARS CONQUERED

From the southwest came a sturdy non-Mayan horde which stormed Chichen Itzá during the 12th century. These were the Toltecs. Under their vigorous leadership were built the largest structures in the city, including the principal temple which looms at the right (Plate X).



Painting by H. M. Herget

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MAYA PRIESTS IN JAGUAR SKINS, WRITHING QUETZAL FEATHERS, AND JADE GESTICULATE BEFORE A MASSIVE TEMPLE

Their influence over the lives of the common people was tremendous. Priests alone could fathom the intricacies of the Maya calendar, which was so accurate that the occurrence of eclipses could be successfully predicted. Certain classes of the priesthood, especially those versed in calendric lore, were carried in litters borne upon the shoulders of the faithful whenever they appeared in public.



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Painting by H. M. Herget

FROM A FROWNING GARGOYLED TURRET MAYA ASTRONOMERS PEERED AT THE SKY

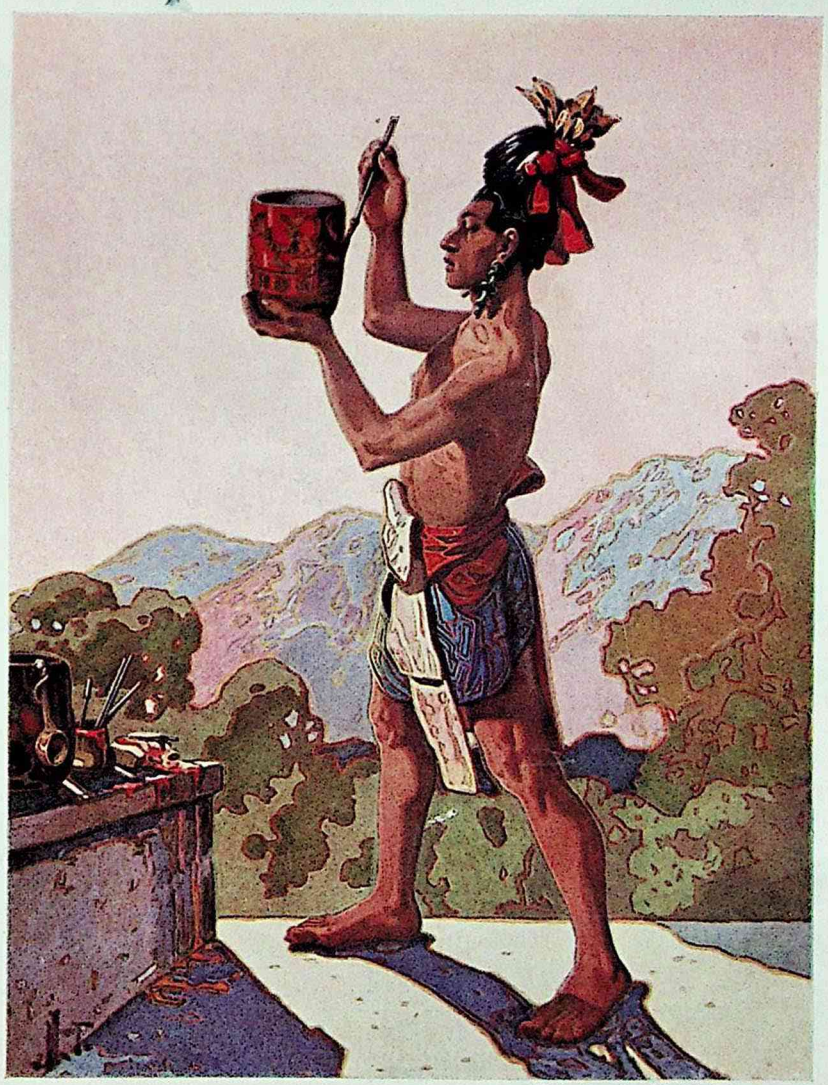
In mathematics and astronomy the Maya surpassed the ancient Egyptians and Babylonians. This round tower, the Caracol at Chichen Itzá, was the most important astronomical observatory in all Yucatán. Narrow openings through the thick walls to the circle of windows near the top formed "lines of sight," or lensless telescopes. Through these, observers watched the heavenly bodies which enabled them to fix the date (Color Plate XII).



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BEARING AND DRESS REVEAL HER NOBILITY

This Maya maiden might have been a chieftain's daughter, for she wears a richly embroidered kirtle fringed with jade beads, an elaborate headdress, and heavy bracelets. A small figure of Yum Kax, God of the Harvest, rests in her hands.



Paintings by H. M. Herget

A MASTER CRAFTSMAN OF THE OLD EMPIRE

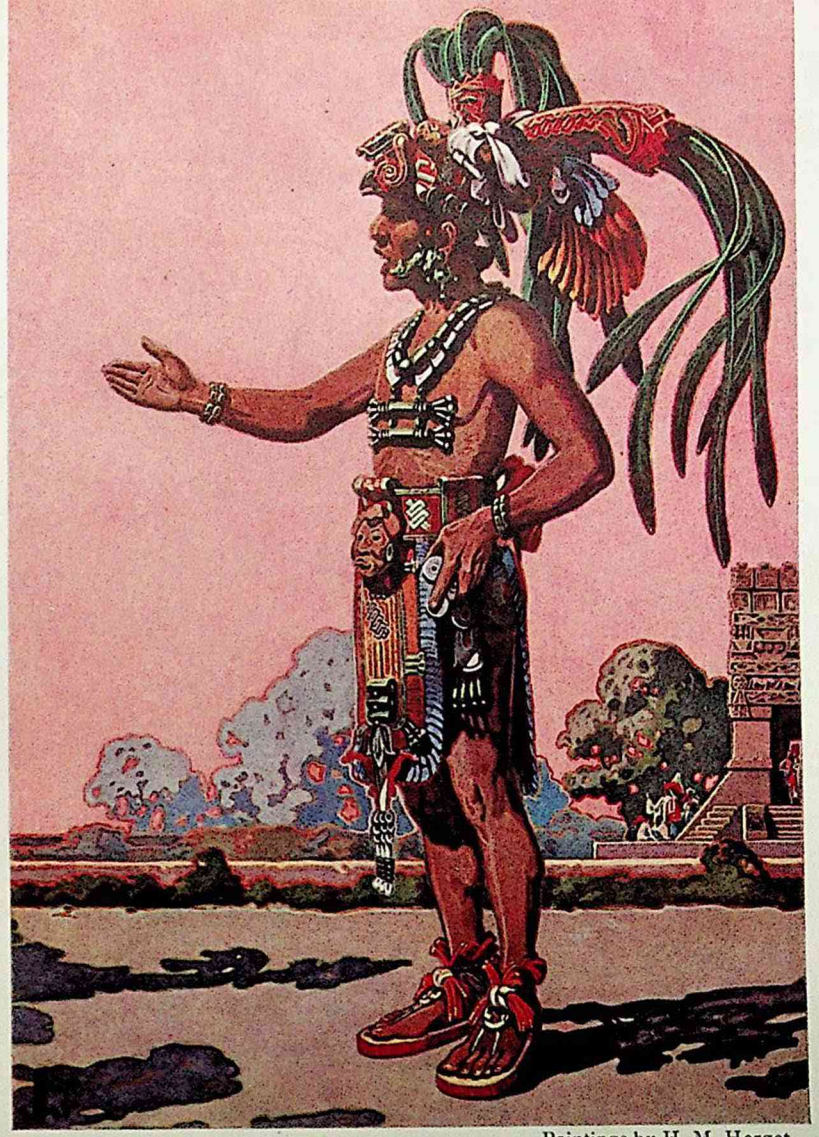
Pottery making became a fine art among the ancient Maya, whose exquisitely painted ceremonial ware was the most beautiful produced by the American Indian in pre-Columbian times. With sure touch, this artist depicts religious rites and scenes on a graceful jar.



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"TRUE MAN" ANCIENT MAYA CALLED THEIR RULER

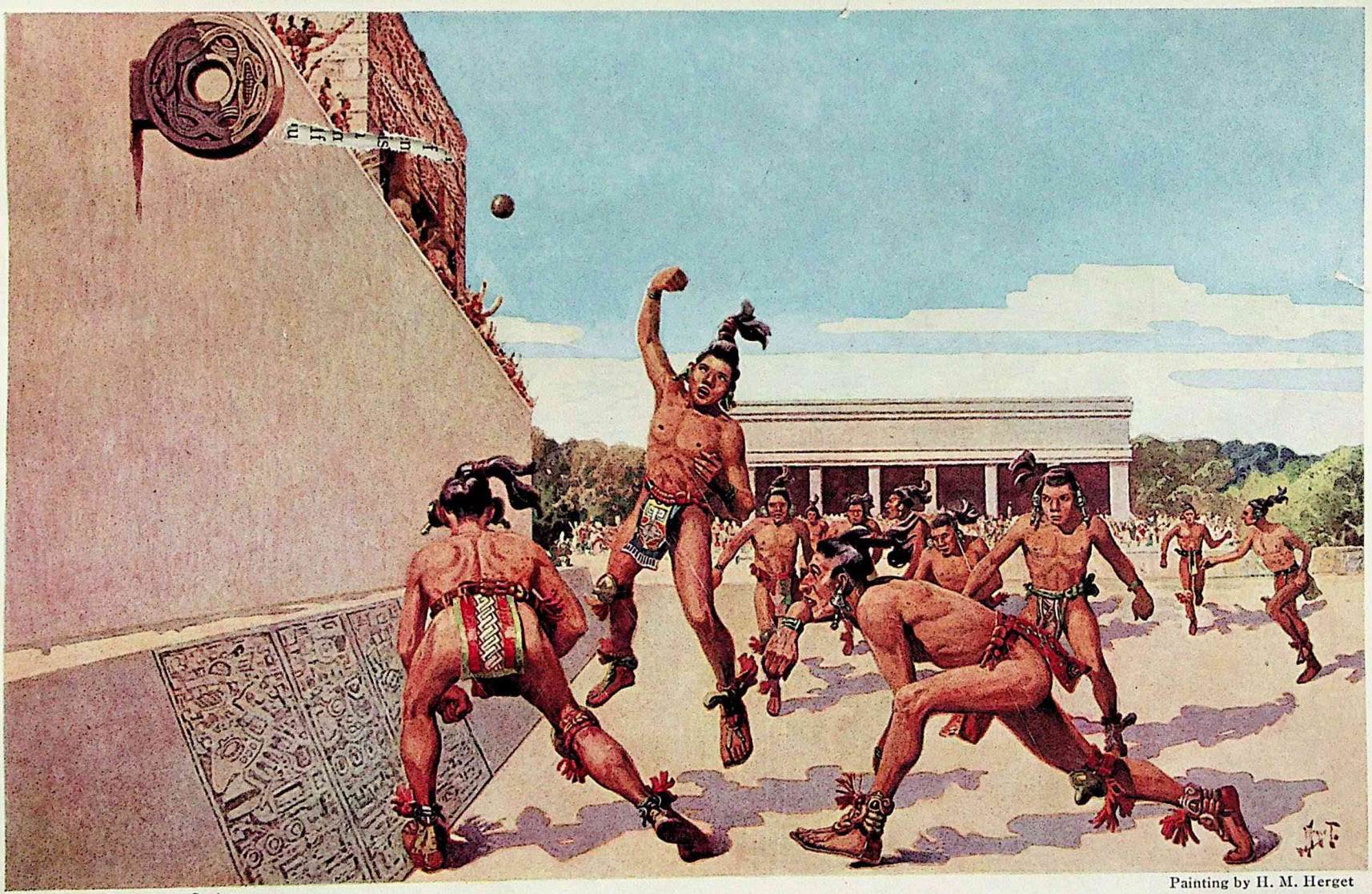
For him were reserved the finest quetzal plumes, jades, embroideries, and jaguar skins. Here he carries the Manikin Scepter, symbol of supreme authority—a short baton bearing a figure of the Long Nose God.



Paintings by H. M. Herget

THIS LESSER CHIEFTAIN WAS THE RULER'S VASSAL

His dominion extended over a small town or village. If he belonged to one of the Maya military orders, the "Jaguars" or the "Eagles," he brought a band of warriors to aid the "True Man" in time of war.



Painting by H. M. Herget

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MAYA YOUTHS MANY CENTURIES AGO PLAYED A GAME THAT SUGGESTS BOTH SOCCER AND BASKETBALL

Six courts have been found at Chichen Itzá, the largest 490 feet long and 100 feet wide, with two side walls 27 feet high. The players, using only their elbows, knees, and hips, tried to drive the solid rubber ball through a stone ring. At the winning stroke all the spectators took to their heels, for ancient custom decreed that the lucky player should receive all their clothing and jewelry. They were hotly pursued by the player's friends.



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Painting by H. M. Herget

ANCIENT MAYA, LIKE THEIR MODERN DESCENDANTS, WERE CORN FARMERS

Their only agricultural implement was the planting stick, a pointed pole about five feet long. Forest trees were felled and allowed to dry out under the fierce suns of March and April. Then they were burned and the corn was planted. Ripened ears were bent over and left to dry on the stalks until December or January. One of the planters drinks from a gourd water bottle, without which even today no Maya goes out to plant corn or to hunt (Plate III).

pursued their tyrannical way, backed by their powerful Mexican allies.

Finally, in the middle of the 15th century, after two and a half centuries of increasing oppression, the Maya, goaded to desperation, banded under the leadership of the then Lord of Uxmal, Tutul Xiu, and attacked Mayapan.

The city was captured and sacked. The ruler and all his family were slain, except one son, who was absent from the city at the time, and Mayapan was depopulated.

A curious result of this war of independence was that both vanquished and victors abandoned their former capitals and established themselves elsewhere.

The Cocoms, under the leadership of the single surviving son of their royal house, founded their new capital at Tibolón, in the north-central part of the Yucatán Peninsula.

The Tutul Xiu, although victorious in the recent war, abandoned Uxmal, where they had ruled for about five centuries, and founded their new capital at a place which they named Maní, meaning "It is finished."

The remainder of the Itzá not only abandoned Chichen Itzá but withdrew entirely from the peninsula, migrating southward into northern Guatemala, whence the Maya had originally come some six or seven centuries earlier.

There, on a peninsula at the western end of Lake Petén Itzá, the Itzá established a new capital called Tayasal. And there, in 1525, the Itzá ruler, Canek, was visited by Hernando Cortez on the latter's heroic march from Puerto Mexico, Mexico, on the edge of the Maya country, across northern Guatemala and southward to Honduras.

This last independent branch of the Maya managed to survive, because of their extreme isolation, for another century and a half, until 1697, when they were finally conquered by the Captain General and Governor of Yucatán, Martín de Ursua y Arizmendi.

THEN CAME THE SPANIARDS

The foregoing brings the story of Yucatán down to the beginning of modern times and the epoch of the Spanish Conquest.

W. H. Prescott's stirring accounts of the conquest of Mexico by Cortez in 1521, and of Peru by Francisco Pizarro in 1533, are familiar to most readers, but the conquest of Yucatán by the two Francisco de Montejos, father and son, from 1527 to 1541, is less well known, having had no Prescott to chronicle its heroic achievements.

Francisco de Montejo, the elder, was one of that band of valiant Spanish *hidalgos* who accompanied Cortez to Mexico in 1519. This expedition touched at the island of Cozumel, off the northeast coast of Yucatán, early that year, and also at places on the adjoining mainland.

These visits constituted Montejo's first real acquaintance with the land of which he and his son were subsequently to become the conquerors, though he had seen Yucatán the previous year on Grijalva's expedition.

Later, when he was in Spain on a mission for Cortez before the Spanish King, Charles V, Montejo obtained from his sovereign the right to conquer the Province of Yucatán at his (Montejo's) own cost, in return for which he was to be named *Adelantado* of the new province, the title to descend to his heirs, and he also was to be given a large grant of land in recompense for his original outlay.

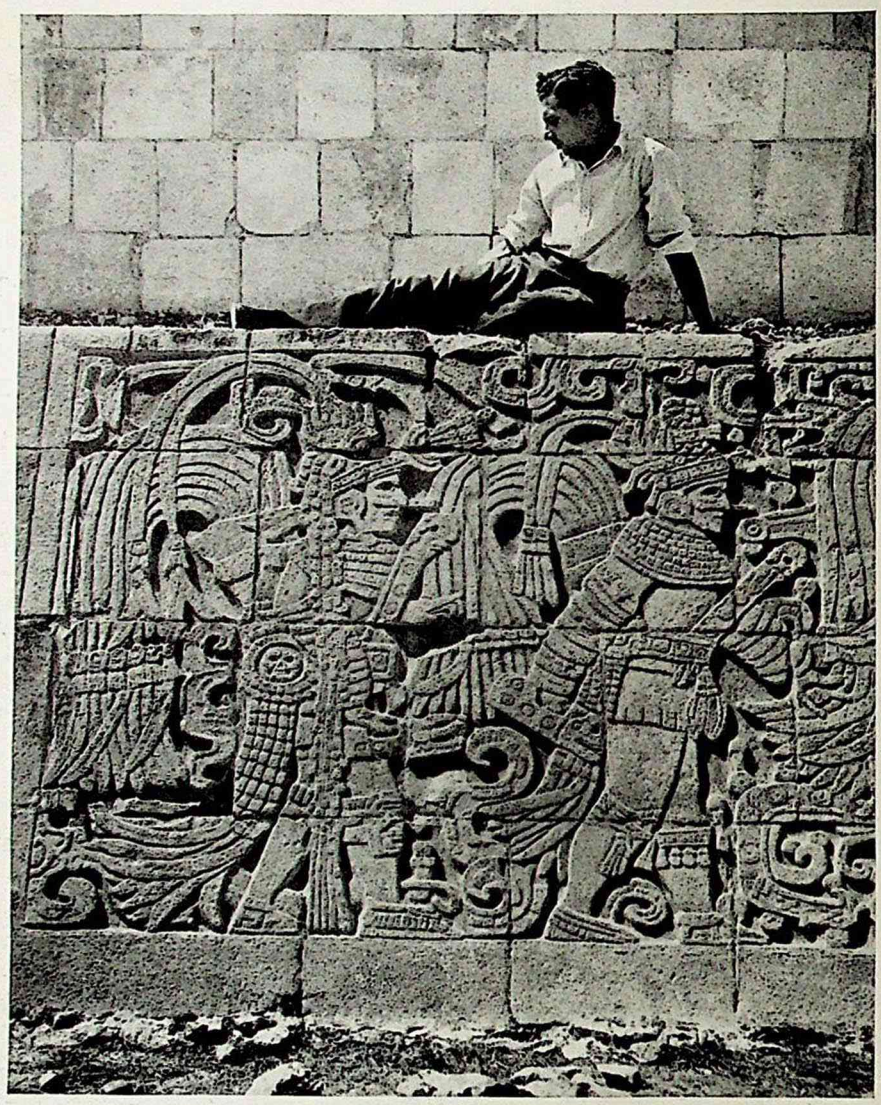
The first attempt to conquer Yucatán in 1527 failed, as did the second, in 1531, but the third and last attempt, in 1540 and 1541, was successful. The army, under Montejo the younger, landed at Champotón on the west coast, proceeded northward, and seized the Indian town of Kin Pech (Campeche). The Spanish *villa* of San Francisco de Campeche, founded there in 1540, is the oldest permanent Spanish settlement in the Yucatán Peninsula.

From Campeche the army pushed on to Mérida, the ancient Maya city of Ichcansiho, where in the middle of 1541 Montejo inflicted a crushing defeat on a coalition of Maya chieftains, which brought about the surrender of the country, and here, on January 6, 1542 (Old Style), the noble and loyal city of Mérida was incorporated by Montejo the younger (page 633).

Yucatán remained a province of the Crown of Spain until the Independence of Mexico in 1821, and has since been a part of the Republic of Mexico.

The second city in size in the peninsula is Campeche, capital of the State of the same name, which has a population of about 18,000. It is more Spanish in character and less modern than Mérida (page 637).

Its narrow streets with old colonial houses; the section of the wall, which formerly surrounded the city, now preserved only on the land side; the land gate facing



RELIEFS AROUND THE BALL COURT AT CHICHEN ITZÁ ARE LOW BUT WELL PRESERVED

The slightly sloping faces of the benches at the bases of the walls bear some of the finest sculptured figures in the Maya area: files of gorgeously dressed fighting men marching toward a centrally placed altar. In several places are represented decapitated warriors with streams of blood spouting from their necks, the streams terminating in serpent heads. Near-by figures hold the severed human heads.

toward Mérida, equipped with portcullis, moat, and drawbridge, the last long since lowered for the last time—all are strong reminders of a day when pirates plied the Spanish Main, landing and looting the Spanish coast towns.

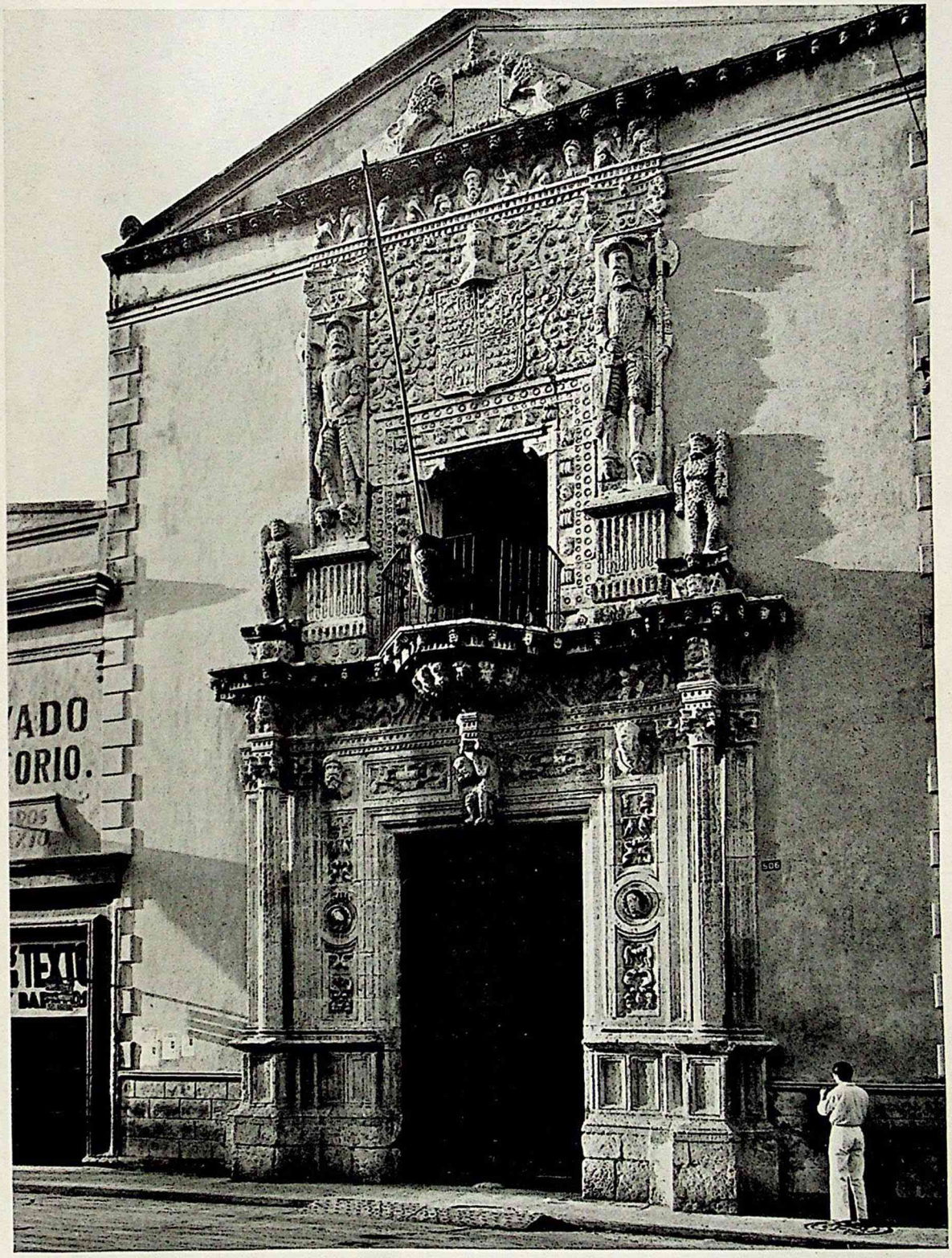
YUCATÁN CARRIES HER ONLY ECONOMIC EGG IN ONE BASKET

Yucatán virtually is dependent upon a single industry. What wealth has come to this isolated region during the past forty years has been through the fiber obtained from the *Agave fourcroydes,* a relative of our own century plant, which seems to be perfectly adapted to the stony, shallow soil of northwestern Yucatán, the principal sisal belt of the peninsula.

The fiber is known locally as henequen, after its Aztec name. Commercially, however, it is called sisal, after the name of a small town on the northwest coast (see map, page 595).

When John L. Stephens, American traveler, amateur archeologist, and diplomat, visited the peninsula in 1840-41, Yucatán was known as the poorest State in the Republic of Mexico. The land was largely owned by a landed aristocracy of some 60 families, and the Indians mostly lived on large *haciendas,* or estates, under a patronal system of peonage made possible by legalized indenture for debt.

By law the Indian could not leave the service of his master so long as he owed him anything. Since the master kept the books and since the Indian's need for money was constant—now a christening, now a marriage, now a burial or an occasional Mass—he was practically never free from debt. The debt even descended to his children. Thus the larger estates never lacked for labor.



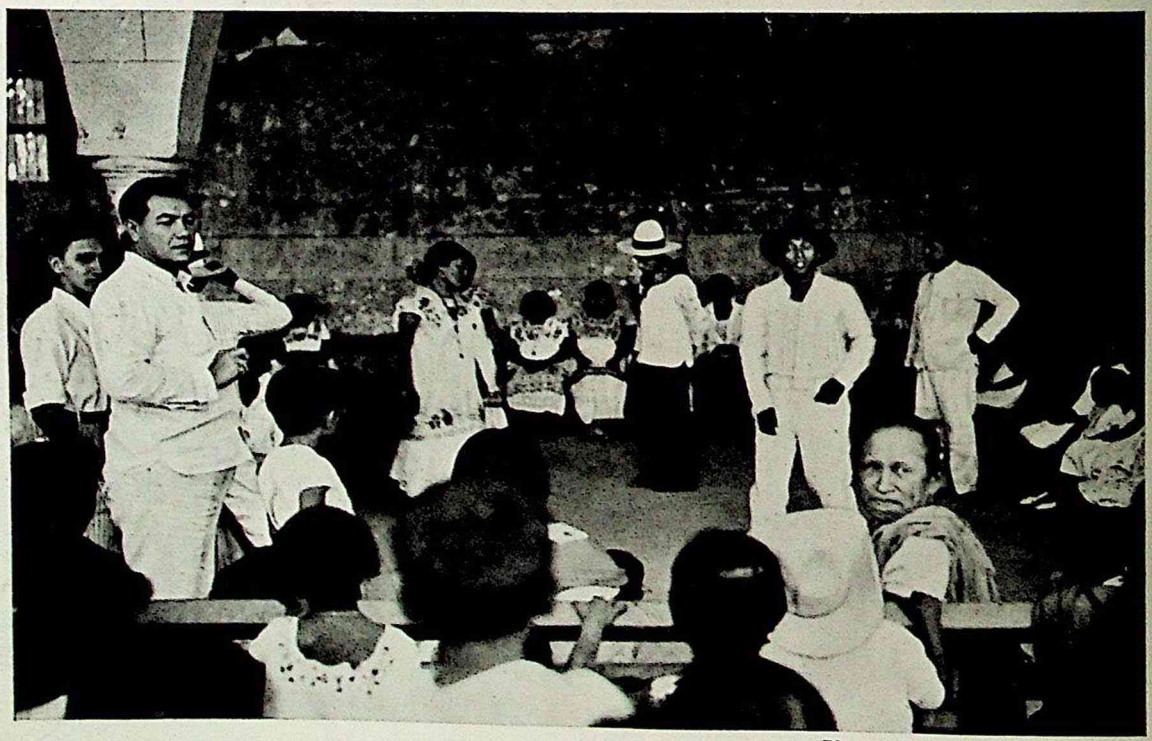
ONLY THE CENTRAL SECTION REMAINS OF THE GRAND PALACE REARED BY THE FOUNDER OF MÉRIDA

When Francisco de Montejo (the younger) laid out the city 394 years ago, he reserved for himself the entire block on the south side of the plaza, where in 1551 he built his luxurious house. All that is now left of the palace is the two-story central section with the great entrance below. The elaborate carving of this façade with the Montejo coat of arms above and the figures of two knights in full armor standing on the anguished heads of conquered Indians amply attest its former magnificence (page 631).



VISITORS TO THE CHICAGO FAIR OF 1893 SAW A FACSIMILE OF THIS PORTAL

These arcades are not uncommon in the ruined cities of north-central Yucatán, examples having been found at Uxmal, Kabah, Chichen Itzá, and Tulum, as well as here at Labna. They seem to have served as ceremonial entrances or gateways to sacred enclosures.



Photograph by Franklin L. Fisher

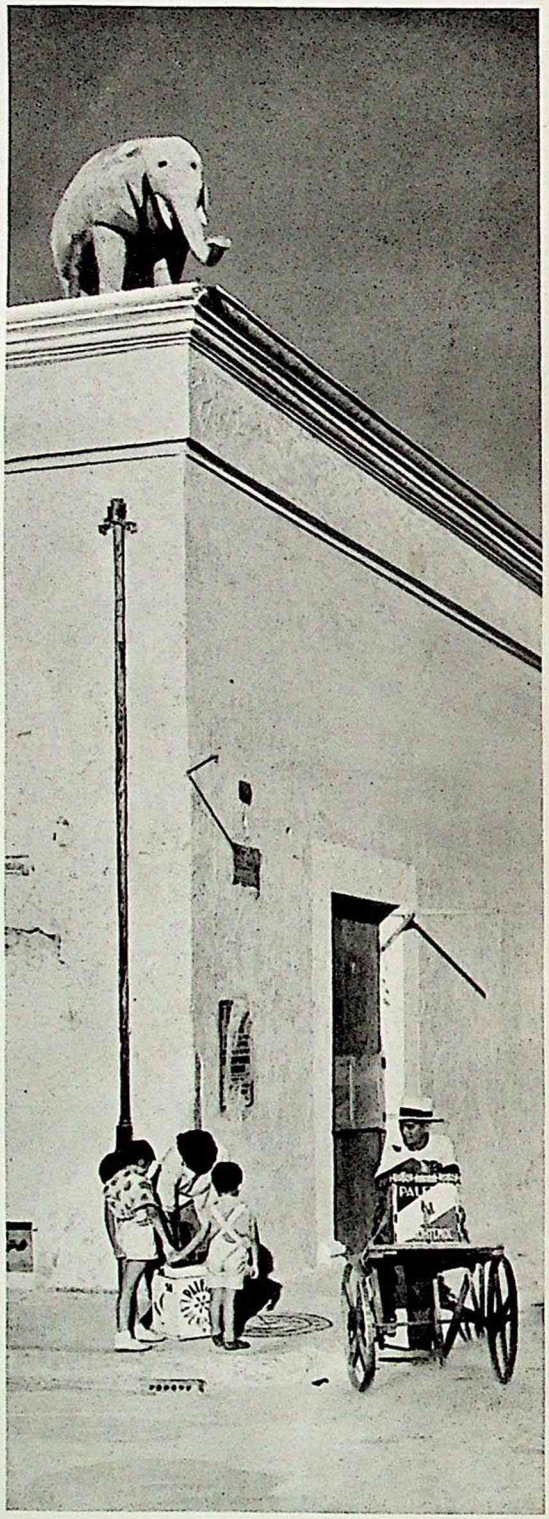
THIS DANCE USUALLY LASTS ALL AFTERNOON AND EVENING

Every fiesta has its *baile* under the arched porch in front of the town hall (page 643). The girls wear embroidered dresses and brilliant scarfs with bright silk bows at the back of their hair. The men express their love of color in lavender, blue, pink, and yellow shirts, with silk handkerchiefs of every shade.



THIS CATHEDRAL OF MÉRIDA IS ONE OF THE FINEST IN THE REPUBLIC

The building, located on the east side of the main plaza, was completed 22 years before the *Mayflower* landed at Plymouth Rock. The majestic dignity of the nave, flanked by six enormous plain, round columns on each side, is happily not spoiled by a centrally placed choir, as are so many of the other early Spanish churches. To the right is the former palace of the Bishop, now used as a Government building. Yucatán is the oldest bishopric in North America.



CHILDREN SHOP AT "ELEPHANT CORNER"

In Spanish colonial times, the Indians could not read, and effigies of animals and fruits were set up as street signs on the roofs of corner houses at Mérida. Very few of these relics remain, a system of numbering having replaced them.

A little sugar was raised and exported. But Yucatán could not compete with Cuba in this field and the peninsula remained a self-supporting agricultural community, consuming what it raised and raising mostly corn and cattle. Sisal was grown for the excellent fiber in its leaves, but the demand was limited.

Before 1897 the fiber used in making binder twine for harvesting our great American wheat crop had been Manila hemp.

One of the first results of the Spanish-American War was the cessation of shipments of Manila fiber to the United States. Immediately began the search for a satisfactory substitute to be used in binder twine.

The *Agave fourcroydes* of Yucatán, growing almost next door, less than 600 miles south of New Orleans, was cheap; its production could be stepped up, and it had no natural enemies to interrupt production, no killing frosts or blights. Its chief Nemesis was fire, the danger of which could be more or less eliminated (page 639).

During the war, Yucatán fiber was increasingly used in binder twine in place of Manila hemp and worked admirably. However, after the war, when Manila hemp again appeared in the American market, it did not replace sisal (page 640).

Discovery of oil could not have been more revolutionary in its effect on Yucatán. Families became millionaires almost overnight. The price of sisal, which had been about five cents before the war, doubled in six months. The crop was raised so cheaply with peonage labor that, after the war was over, by the simple expedient of always keeping its price just below that of Manila hemp, the Yucatecan planter easily held the market.

THE GREEN GOLD OF YUCATÁN

Those were the bonanza days of Yucatán. Under the wise administration of Governor Olegario Molina, Mérida was swiftly transformed from a backward provincial town into an attractive modern city.

Before the sisal prosperity, the unpaved streets were lakes of mud and water in the rainy season, billowing clouds of dust in the dry months. All year round outcroppings of the native limestone made them all but impassable for vehicles except large wheeled *diligencias* and carts. By an export tax on every bale of sisal, Mérida was paved with cement, brick, and asphalt in



Compania Mexicana Aerofoto

OLD CAMPECHE LANGUISHES BESIDE ITS SHALLOW GULF

When commerce departed for deeper roadsteads, the port fell into disuse and only the wall built to protect the city against the raids of the buccaneers remained. This barrier had been built so high that it kept out not only pirates but sea breezes; and about 30 years ago it was torn down except for a small section on the land side (page 631).

less than four years. Waterworks were built and palatial mansions of the sisal aristocracy were erected along the Paseo de Montejo, Mérida's Park Avenue.

Fine coaches and horses were imported, later automobiles. Planters and their families traveled in Europe, returning with many trunkfuls of Parisian creations for the pre-Lenten balls of El Carnaval, which New Orleans celebrates as the Mardi Gras.

Luxury, splendor, princely magnificence were rife, and still the green gold continued to flow.

However, in 1915 the Mexican Revolution, in the person of the Carranza general Salvador Alvarado, hit the peninsula, and in 1917 the United States entered the World War.

Almost overnight General Alvarado consolidated the marketing end of the sisal industry into a single selling agency, to force higher prices from the American purchasers.

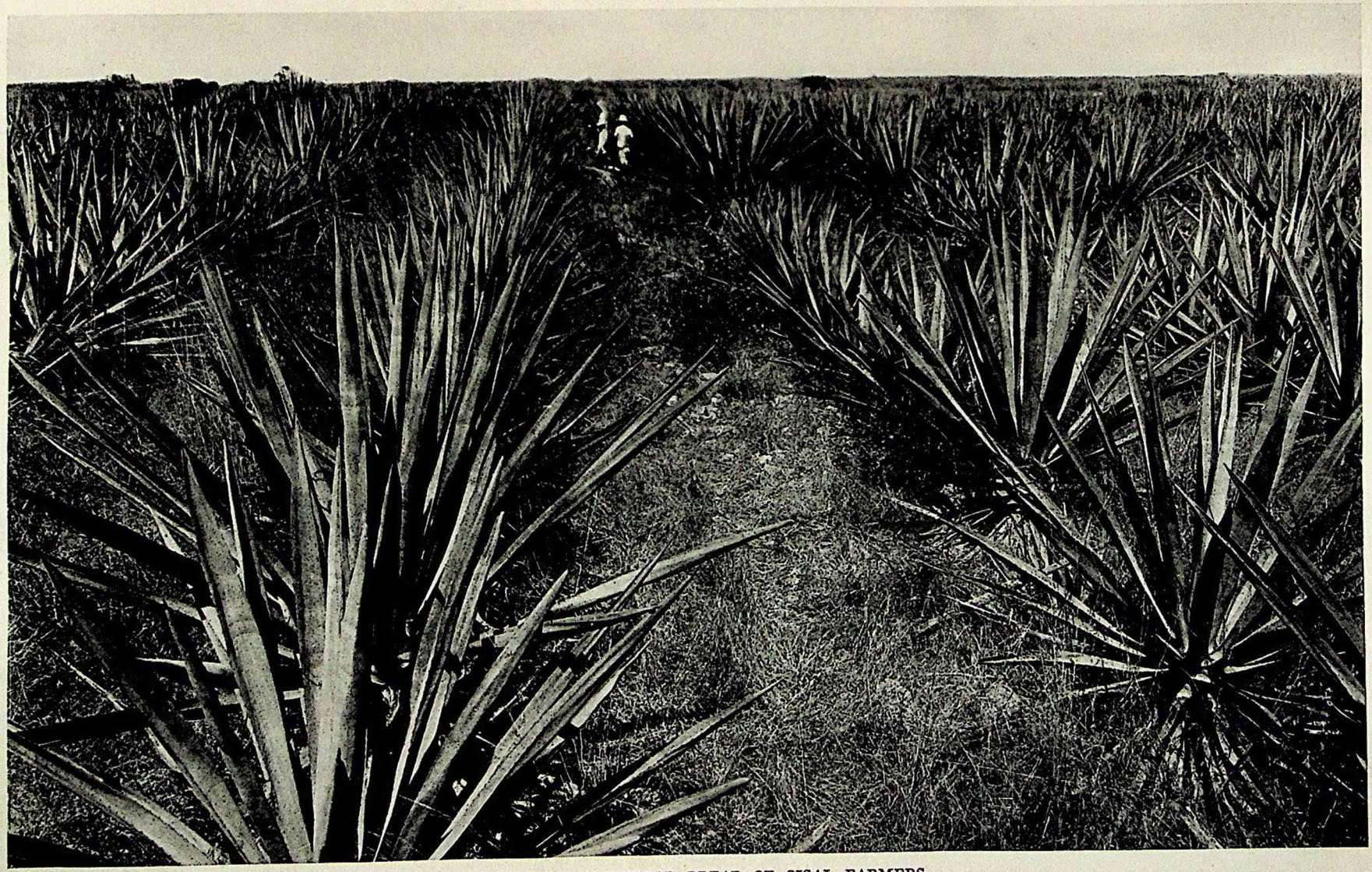
INDIANS EMANCIPATED FROM DEBTS

The Government undertook to market the sisal crop, and since the Government controlled all the railroads in the peninsula, and wharfage and warehouse facilities at the port of Progreso, those few planters who refused at first to sell to the Government marketing agency found themselves



MÉRIDA BRISTLES WITH WINDMILLS

Nearly every house has its own well dating from Spanish times, when there were no waterworks. The trade winds furnish free power most of the time for some 14,000 of these pumping devices, which rise above the flat-topped houses (pages 591, 636-7).



FIRE IS THE PRINCIPAL DREAD OF SISAL FARMERS

Because the plant will burn green on the stem, high towers are built in the fields from which watch is constantly kept in the dry season, December to May, to prevent the start and spread of devastating conflagrations. The long, fibrous leaves require eight years to reach the point where they may be cut for commercial use, though during this period the crop needs no care beyond bushing twice a year between the rows. A good plant will continue to bear from 15 to 20 years.



HENEQUEN, OR SISAL, IS THE GREEN GOLD OF YUCATÁN

This bale of henequen fiber, ready for shipping at the Hacienda Chichi, near Mérida, will be carried by autotruck to Progreso, the port of Yucatán, and thence shipped to New Orleans. From there it will be sent to a factory making binder twine. Eventually it will find its way to the farms of the wheat belt, where it is used in tying the cereal into shocks (pages 632, 639).

unable to obtain freight cars to move their crop. Soon they, too, signed on the dotted line.

General Alvarado did not stop there. He wiped out the debts of the Indians to their masters, and the former, no longer bound to the plantations by debt, began to roam.

In the meantime, the bumper American wartime wheat crops of 1917, 1918, and 1919 lifted the price of sisal sky-high. Whereas the highest price paid for Yucatán fiber during the Spanish-American War had been 11½ cents a pound, Alvarado advanced the price to 19¼ cents a pound. American farmers, in spite of the aid of a Congressional inquiry, had to pay.

But Alvarado allowed the helpless planter only 7½ cents a pound for his sisal, although the cost of production had advanced sharply after cancellation of the laborers' debts.

When I first visited Yucatán in 1907, the Indian was receiving 25 cents for cutting a thousand leaves of sisal, but in 1918 he demanded and got $1.25 per thousand leaves. Even at these all-time high wages he would work only one or two days a week. The rest of the time he quietly swung in his hammock and watched the world roll by.

In those days one saw the amazing economic paradox of an increasing demand and a rapidly rising price accompanied by a diminishing supply, because of labor's refusal to participate in the golden harvest.

The altitudinous price of Yucatán fiber brought other fields into production, principally in areas of Africa, the Bahamas, and Cuba, so that when the bottom dropped out of the market after the war, prices plunged to new lows from which even today they have only partially recovered.

CHICLE HUNTERS FOUND IMPORTANT SITES

Though by no means the poorest State in the Mexican Republic, as Stephens called it a hundred years ago, Yucatán is very far indeed from having the largest income, as it did in 1918. Thus, for nearly the last



THE TINY CHAN YUC IS A FAVORITE PET IN MÉRIDA

Meaning "small wrist," its Maya name obviously was inspired by its extremely slender legs. Two of these native deer were presented to the National Zoological Park, at Washington, D. C., by the author's wife in 1935. They were brought to the field quarters of the Carnegie Institution of Washington at Chichen Itzá when they were very young, one of them only two weeks old. Their mothers had been killed by Indian hunters. Both thrive in their new home in the United States.

four decades sisal has been the most important economical and social factor in contemporary Yucatán history.

Yucatán's second most important industry is chicle, the only commercial use of which is to make chewing gum "chew." Chicle is obtained from the sap of the *sapote* (sapodilla) tree. When this sap is boiled, it hardens and forms pure (unsweetened, unflavored) chewing gum.

The sapote trees grow most abundantly in southern Yucatán, Campeche, and Quintana Roo, where Maya ruins are most numerous.

For many years the writer offered the chicle hunters rewards for information leading to the discovery of new groups of ruins buried in the dense forest hinterland. As a result of these rewards, a number of important archeological sites have been discovered.

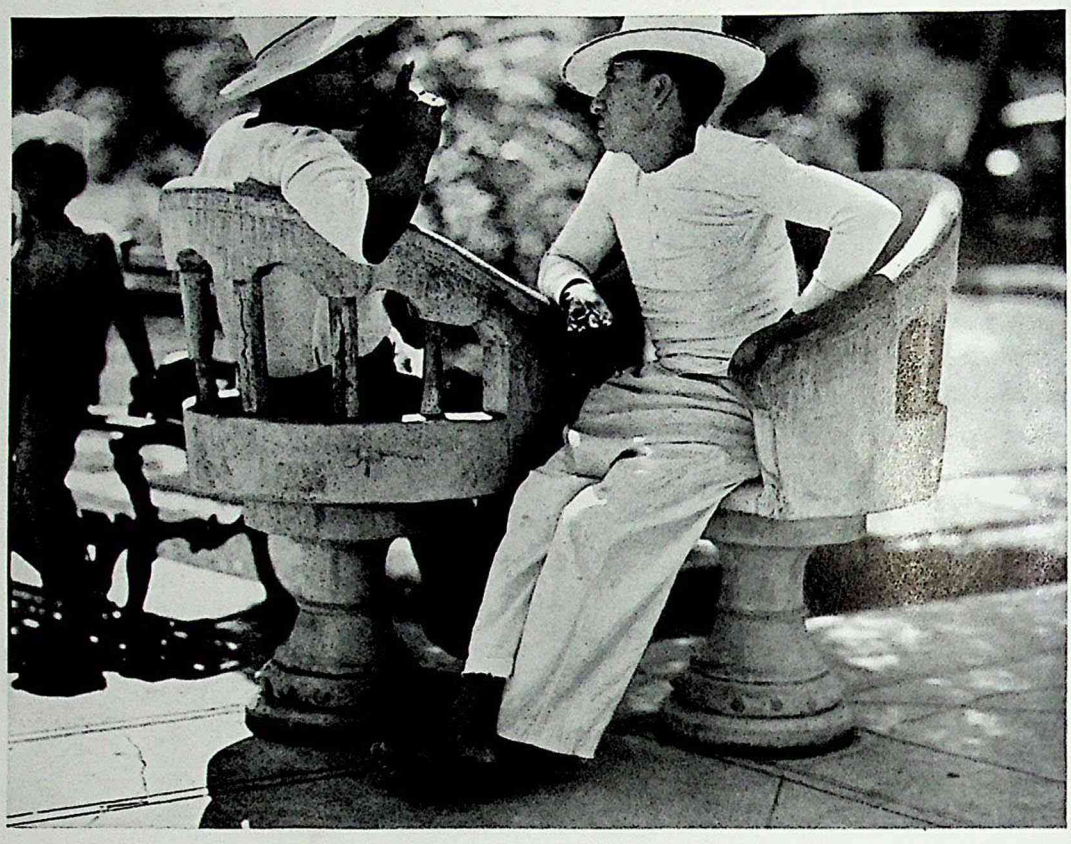
The modern Maya, who still comprise probably half the population of the peninsula, are cheerful, friendly folk, endowed, in my opinion, with more likable qualities than any other Indian people.

They are short in stature, the men averaging about 5 feet 1 inch and the women only 4 feet 8 inches. All Maya have exceedingly broad heads, which is probably their most marked physical characteristic; their hands and feet are small and beautifully formed.

Add to this eyes nearer black than brown, a strong, well-formed Roman nose, an equally well-formed, expressive mouth, and a skin of dark, golden brown, with warm high lights, and you have one of the handsomest native races in America.

They are cheerful, friendly, not quarrelsome even when drunk, exceedingly clean, home-loving, and, when the need arises, industrious.

The Maya home consists of a palm- or grass-thatched hut with sides of saplings, which may or may not be daubed with



"LOVE SEATS" INVITE A REST IN MÉRIDA PLAZA

These concrete equivalents of an American lawn chair popular in this country in the nineties are found in many public squares in Yucatán.

mud. These are rectangular, with rounded ends, usually about 25 feet long, 10 to 12 feet wide, and 15 feet high to the ridgepole of the steeply sloping roof.

There are no windows in typical houses and only two doorways, one in the middle of each of the long sides, directly opposite each other (Plate IV).

Doors usually are made of woven withes. Directly behind the house is a lean-to, the *koben,* which serves as the kitchen. The house proper has only one room.

Furniture comprises hammocks, which are rolled up on the rafters during the day, a few low, comfortable stools, a table with the figure or painting of a saint, often surrounded by colored pictures from old American magazines, catalogues, even calendars and rotogravure sections of newspapers, and artificial flowers.

A box or tin trunk may hold a few valuables, the women's gold chains and fiesta jewelry. Frequently there is a sewing machine. Above the rafters corn, beans, and odds and ends are stored.

Everybody sleeps in this combination living room, bedroom, dining room, and chapel, frequently two to a hammock, with the dogs lying beneath and occasionally a setting hen in a corner. The men and boys of the family eat in the main house, and the women and girls in the kitchen.

The Maya Indian is devout. He was in ancient times, when, under the direction of his own priests, to his own gods he reared tremendous stone pyramids and temples, the ruins of which by the thousands now lie buried in the forests from northern Yucatán to the highlands of Guatemala.

CHILD'S NAME INDICATES BIRTHDAY

He was equally devout during the Spanish colonial period, when, under the supervision of the Franciscan fathers, he built the enormous churches and spacious monasteries with their cloistered courts, and exchanged his own pagan deities for the White man's God. Even today much of his own former religious beliefs colors his comprehension of the Church's teachings.

He names his children not for himself or his wife or other members of the family, but for the name of the saint on whose day the child happens to be born.

There is an almanac in Yucatán called "El Calendario de Espinosa," from the name of its founder. This has been published since 1824 by succeeding generations of the Espinosa family and is the source of all given names used by the Maya. The name in practically every case indicates the birthday.

Maya fiestas are usually those of the Church, the biggest fiesta of the year in any village being the day of its particular patron saint. These patron-saint fiestas usually last a week or ten days, culminating on the saint's day.

They suggest village fairs. Booths are set up, games, shooting galleries, always a superannuated merry-go-round, and a bull ring, while under the broad cloisters of the town hall there are Indian dances morning, noon, and night (page 634).

DANCER NOT CONSULTED ABOUT PARTNER

The Maya dances of today are not those of the old pagan times. The latter were thought by the early Franciscan fathers to be immoral, pertaining to the Devil, and they were speedily replaced by Spanish dances, such as the *jarana* and the *zapateo*.

Though the Indians dance in couples, it is considered improper if the partners touch each other.

The man, with his hands hanging at his sides or one hand resting on his hip, circles slowly about the girl with a shuffling step; the latter bobs around still more slowly and less gymnastically. The man does not pick out the girl with whom he dances. This highly important duty is performed by a sort of master of ceremonies. He asks the girl to dance, escorts her to the dancing floor, and then selects her partner without consulting her.

The man commences dancing and presently the girl joins him. The music keeps up until the last girl has nodded curtly to her partner and returns unescorted to her seat.

Formerly it was the custom for the Maya boys, when some girl was exceptionally graceful, to take off their broad-brimmed straw hats, in which they usually dance, and crown the fair *bailadora* with them. Sometimes a really beautiful dancer might have as many as four or five straw hats pyramided on her head during one dance.

After she had returned to her seat with the hats in her hand, their respective owners came forward and bought them back from her, each giving her two or four *reales*, as their pocketbooks permitted.

These delightful old customs are passing, however, and now "el fox" and "el one-step" are beginning to displace the more picturesque *jarana* and *zapateo*.

But the chief business of the Maya man today, as it has been of his forefathers for century after century, is to raise corn for his family, and the chief occupation of his womenfolk today, just as it was a thousand years ago, is to prepare that corn into *tortillas* for the family's daily meals.

The way each goes about his or her task has remained practically unchanged throughout the intervening centuries. The man now has a steel ax and machete to fell the forest, instead of ringing the trees with his stone ax. His wife, when she lives in a village, takes her own corn to the local mill and has it ground for a few *centavos*.

In the remoter villages a few women have hand-turned grinders somewhat like a small coffee grinder, but the great majority still use a slab of stone with a stone grinder held in the hand (Plate VII).

An important task facing the Carnegie Institution investigators in Yucatán has been to determine what the dietary of the average Maya family was in ancient times, so that estimates may be made of the former population Yucatán might have supported with the system of agriculture then employed.

THE MODERN MAYA MENU

The best approach to this important question has been to study the dietary of the modern Maya, which, in spite of the introduction of certain European foods, chiefly animal proteins, such as beef, pig, and chicken, seems to have remained much as it was in ancient times.

The relative percentages of carbohydrates and animal proteins are probably about the same today as they were before the discovery of America.

While the animal proteins of the modern Maya come chiefly from beef, pork, and chicken, in former times they were derived principally from deer, peccary, and wild turkey, all abundant.

The affectionate nickname the Maya



FOR HIRE, A MÉRIDA "TAXI," AT 28 CENTS AN HOUR

Yucatecan horses are small, probably because of scanty grazing. Since the streets are very narrow, the sidewalks less than a yard wide, and the houses built to the edge of the property lines, most corners are blind. Mérida *coches* are built so that the front wheels can swing in under the driver's seat for short turns.

gave to their country in ancient times was "The Land of the Wild Turkey and the Deer" (Plate I).

But the percentage of animal protein in the Maya dietary is not high, and if anything was even less, formerly, than it is today.

Exhaustive studies by different investigators in various parts of the peninsula all yield the same result: from 75 to 85 percent of everything the average Maya eats is corn in one form or another.

The remaining 15 to 25 percent of his food consists of *frijoles* (beans), chili, chocolate, honey (which is his sugar), squashes, a few native tubers, and fruits.

A careful study of Maya agriculture by agronomic experts has established two interesting facts. First, the simple system of raising corn practiced today throughout the Yucatán Peninsula would support indefinitely, without the necessity of importing any food whatsoever from the outside, a minimum of five times the peninsula's present population of about 400,000, or at least two million people. Second, to support the average family of five, a Maya Indian has to work in his cornfield altogether only about sixty days out of the entire year.

The first fact easily accounts for the more numerous population which undoubtedly occupied this region in pre-Columbian times, as compared with today; and the second as clearly explains how the ancient Maya found time to build their many cities of cut stone.

An environment admirably suited to the Maya system of raising corn, which made the food quest relatively simple; a superabundance of excellent and easily quarried building material, the local limestone, which when burned gave them lime for their mortar and also furnished a coarse marl gravel that served as sand; wise leaders, who developed a highly efficient governmental organization under which large public works were planned and successfully carried out; and, finally, the native genius of the Maya themselves, elevated and sustained by a lofty religious philosophy—these are the principal factors that made the Maya civilization the most brilliant cultural achievement of ancient America.

NEW ENGLAND SKI TRAILS

Snow and Ice Sports Transform Whittier's Winters of Snowbound Seclusion Into Seasons of Outdoor Recreation

By Daniel Rochford

TUCKERMAN'S Ravine, one of the most famous skiing spots of New England, looked in the first picture I saw of it like the dreamland of all dub skiers. It seemed so big and round and comfortably full of snow that I thought it would be simple to climb up one side of the huge snow bowl, shoot down into the bottom, kill my speed by coasting up the farther slope, and then turn and repeat the performance as long as the thrills lasted.

When actually I stood, a winter later, my knees trembling with the fatigue of climbing about one third of the way up the headwall of Tuckerman's Ravine on Mount Washington, and gazed down at those terrifying distances, I remembered how as a small boy I went to a lake for swimming, intending to walk boldly beneath the water, see the fish swim about, and then walk out.

Arrived at the lake, I was badly frightened when my big brother tried to pull me out into the water.

EASY TRAVERSES UNHEROIC BUT SAFE

I was scared in Tuckerman's that first trip. I did manage to ski down from where I had climbed, but not in the brilliant *schuss* (page 646) I had visioned.

Instead, I took it in an unheroic series of easy traverses, zigs and zags, saving all attempts at anything but stopped turns for the humbler gradients of the vast snow apron that fans out to the little headwall, an eighth of a mile below.

True, I had picked the worst day of the year to ski in Tuckerman's. It was the day of the U. S. Eastern Olympic ski trials, March 31, 1935, and a thousand people, spotting the ravine, added the hazards of collision to the terrors of terrain (page 656).

A thousand feet it is from the lip of the headwall to the floor of the ravine, just 50 feet less than the drop from the observation tower of the Empire State Building to the street!

That afternoon 55 contestants started from the cone on the top of Mount Washington, ran down its 45-degree slope, slowed at the lip of the headwall, and then slipped over its rim and shot at dizzy speed down its sheer steeps.

Alexander H. Bright, seeded number one, took the cone straight, shot over the rim of the headwall, fell 20 feet, landed facing the wrong way, made a complete jump turn (page 658), traversed, turned for the control flags high on the slope, and *schussed* to the finish in 1 minute 36.2 seconds from the top of the mountain.

John Durrance, elder brother of the Olympic star Richard Durrance, made a single traverse and ran the headwall straight. His speed was so terrific that his legs failed beneath him, and he fell almost at the finish. He lay there for an awful second, staggered to his feet, and slid on through the finish flags for a time of 1:37.

The next eight men, in order of times, varied from 1:42 to 2:34.

Starters left the summit at one-minute intervals and the timing was by short-wave radio. More than half the men, including champions who later represented the United States in the Olympic races abroad, fell. And once a man fell high on that headwall, he rolled heels over head, skis and all, twenty times his length before he could even begin to slow his slide.

SKIING OFFERS PERSONAL TRIUMPH

When one has learned to enjoy it, skiing wins an affection akin to that of a golf addict for his game. No other sport, it seems to me, is so much a matter of self. Skiing is essentially a solo performance.

In my own limited experience, I have tried many sports. Polo has its tremendous thrills, but, after all, the horse does much of the work. Sculling has its charms, but also its labors. I have never ridden a free surfboard. Perhaps that is as thrilling, for the sport resembles skiing. I have soloed gliders. Soaring certainly is "tops." But even there, the machine introduces an impersonal element.

I suppose the first man to stand on the top of Everest will have a feeling of personal achievement beyond that of any other mountaineer. But in a more humble way, every skier who stands at the top of a beautiful, unmarked stretch of new snow, waiting for the clean, flowing track of his own skis, experiences that exaltation. It is like being the first one out in the crisp frosty air of an autumn morning. The skier gets a chance to breathe it before anybody else has breathed it.

Racing has its place. It is a thrill to see a well-co-ordinated, confident runner come streaking down a narrow trail, cutting a hot corner by a graceful quick thrust with his heels and an almost instantaneous skidding of his skis, which changes their course; or to watch a skier in a slalom race, riding a steep slope in easy *schusses*, checking his speed with broken cristies, or "tail-wagging," taking deep or soft snow in a graceful telemark, or steered turn.*

Some racers crouch very low to keep their center of balance near the ground. Others ride erect and confident.

The most experienced make their control movements so easily that they seem to float while the skis do the turns. "Tempo stuff," that, the acme of controlled skiing.

But a person alone in the wilderness, finding a pair of skis and knowing what they were, could find fun long before he found technique.

As a child on the Kenwood hills behind my home in Minneapolis, I learned to stand on skis, then to walk on them, then to run on them, then to slide on them, and then to stop and maybe fall down on them.

The stopping was the hardest part. I'm still working on that phase of it.

No matter what language one uses to name it, that sequence is about all that skiing is. I used to crouch down when I was afraid of falling. It was 25 years before I knew I was doing an "Arlberg crouch."

I still lose patience when I hear some fairly good veteran chilling the ambitions of a would-be skier with a display of ski terminology. Yet even the most kind-hearted group of novice skiers, each owning skis and harnesses from which price marks have not rubbed off, will register derision when they notice some uninstructed girl or boy with a pair of store skis having only the leather loop, or toe strap, on them. "Toe-strapper" is a word of open scorn.

* "Schuss," a German word meaning "rush," or "swoop," has been adopted by American skiers, both to describe the steep slope down which they shoot straight ahead, or the act of skiing thus. "Cristy" is an Americanized abbreviation of "Christiania," meaning a turn accomplished by skidding the skis. "Tail-wagging" denotes a series of interrupted cristies. A telemark is a turn accomplished by steering the skis.

CHILDREN AND GIRLS HELP THE SPORT

Children always have learned skiing with only toe straps. Grown people will find for themselves that toe straps are good for nothing except straight-ahead, easy slides. A pair of skis which do not turn with the feet obviously cannot be controlled. I have kind silence for the toe-strappers.

Of course, when a grown girl comes to my snow-covered golf course in the winter with high-heeled shoes and tries to ski, that is asking too much of tolerance. When she falls and twists her ankle, as she well may, her suffering is a just reward for her stupidity.

Girls, however, must be credited with much of skiing's popularity. I suspect many became interested when attractive ski costumes were made available. They looked so swagger in the clothes that they had to carry on, buy skis, board the snow trains, and become skiers. And when all the pretty girls were going on the snow trains, they were not going alone.

I have no intention of ever running the full headwall in Tuckerman's. My racing days are all behind me. The only skiing championship I hold and cherish is the neighborhood championship won for riding down the vertical pitch from the high tee by the bridge on the Winchester, Massachusetts, golf course on a single ski without falling.

My victory there was due, undoubtedly, to the fact that I was one of eight children and that as youths we frequently had to get along on half a pair of skis apiece.

I used to argue with some of our Olympic skiing stars that New England's down-mountain trails were not so important as they asserted. Today there are many, even some Olympic racers, who agree that racing trails are not sufficient diet for the best good of skiing.

To have the world's most extensive network of down-mountain trails, more than 300 miles of them, as New England has,



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Finlay Photograph by B. Anthony Stewart

PULL YOUR FEET IN, CROWD CLOSE, AND HANG ON TIGHT!

Now and then a toboggan ride at North Conway, New Hampshire, comes to a sudden end when a careless foot is caught in the narrow runway. Chief contributor to New England's boom in winter sports has been the enthusiastic public support of the "snow trains," which carry thousands from New York and Boston to popular skiing centers or to the nearest good snow.



NEW WORLDS TO CONQUER—ON SKIS!

At such famed resorts as Pecketts, on Sugar Hill, near Franconia, New Hampshire, skiers can learn the fine points from recognized experts, many of them imported from Europe. Togs are warm but light, allowing freedom of movement.



© National Geographic Society

Finlay Photographs by B. Anthony Stewart

CITY FOLK WITH SLENDER "SEVEN-LEAGUE BOOTS" STOP TO STARE AT PLODDING OXEN

A citizen of North Conway uses old-fashioned ox power for some of his winter chores. Roads kept open by powerful plows bring distant skiing centers within easy reach by bus or automobile.



READY FOR A MILE-A-MINUTE SPIN ON LAKE CHAMPLAIN—IF ONLY WIND COMES!

In a good breeze and when the ice is smooth and clear of snow, ice boats at Burlington, Vermont, race with the speed of the wind. Often the craft lift their windward runners two or three feet from the ice and buck like bronchos. Crews find the sport bitterly cold.



© National Geographic Society Finlay Photographs by B. Anthony Stewart

ALL OUTDOORS FOR A DINING ROOM, AND THE PRESIDENTIAL RANGE FOR A BACKDROP

Hot coffee, cheese, cold meats, and fruits are served in mid-afternoon at this resort near Franconia. Warmly clothed and with plenty of healthy exercise, lovers of winter sports defy zero temperatures.



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Finlay Photograph by B. Anthony Stewart

GOOD FELLOWSHIP THRIVES AMID THE CLEAR-CUT WINTER BEAUTY OF THE MOUNTAINS

Against a majestic background formed by New Hampshire's spreading Intervale and the snow-capped Presidential Range of the White Mountains, three skiers stop while an expert dryly explains that both skis must be kept going in the same direction — unless you want an awkward spill. Skiers usually emerge unscathed from falls that would mean broken bones without the friendly cushion of the snow.



© National Geographic Society

OFF FOR A MORNING'S FUN

Girls become as expert as their escorts, and, at a distance, look the same! New England ski trails vary from mild pasture runs to breath-taking zigzag plunges down the sides of mountain ravines.



Finlay Photographs by B. Anthony Stewart

ICICLES MAY MEAN FAST SKIING

A thaw, then a freeze, forms an icy glaze, and a light snowfall over the crust makes a good skiing surface. Instead of heavy furs, this modern skier wears a windproof fabric shirt and loose woolen trousers.



NEW ENGLAND TOWNS ARE KEEN ABOUT "THE FASTEST GAME ON FEET"

On the rink at North Conway, the local hockey team meets a rival sextet from Concord, New Hampshire. A lad of 14 played for the home team with all the rugged daring of his older mates. Heavily padded is the crouching "goalie," who must stop the whizzing puck.



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Finlay Photographs by B. Anthony Stewart

BEGINNERS TEST BALANCE AND PATIENCE ON "NURSERY SLOPES"

Smooth, easy grades on this golf course at Kearsarge, New Hampshire, afford novices a gentle initiation into the tricky arts of snowshoeing and skiing. Now the skiers' cries of "Track!" echo over fairways where "Fore!" is heard in summer.



CAREFREE SUN BATHERS LOLL IN THE LEE OF AN ICY PARAPET

Snug steamer chairs in the ice palace appeal to those who like to take the air and sunshine lying down at this pleasure spot in the White Mountains. Many a New England inn, formerly open only in summer, now caters to guests for winter sports.

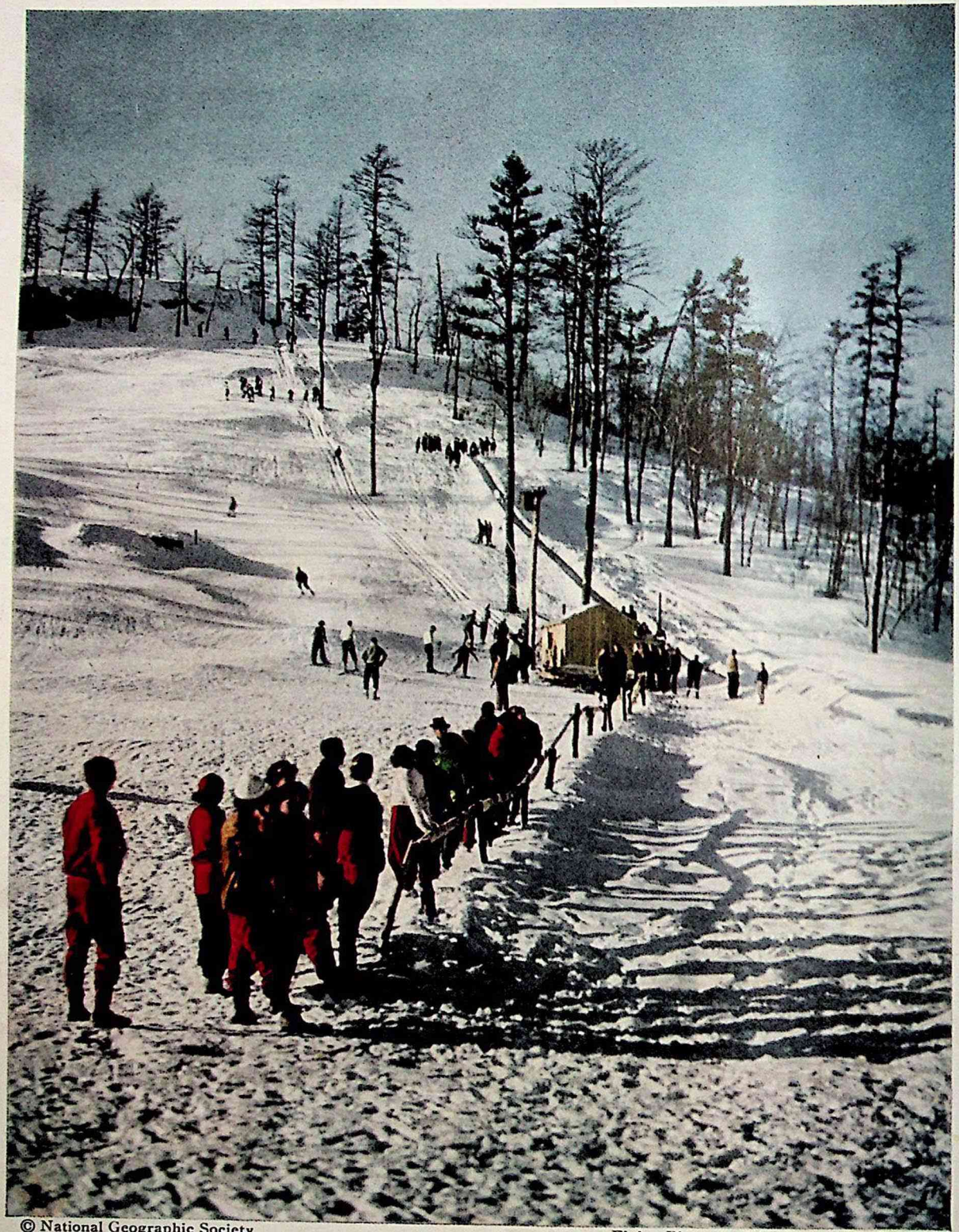


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Finlay Photographs by B. Anthony Stewart

WEEK-END TRAINS POUR EAGER CROWDS INTO QUIET VILLAGE STREETS

Snow trains from New York and Boston, often in several sections, may drop as many as 1,500 or 2,000 skiing and snowshoeing devotees at a selected goal in the middle of the morning and pick them up again at night. Here they invade North Conway.



© National Geographic Society

Finlay Photograph by B. Anthony Stewart

DOWN HARD-PACKED SLOPES THE SKIERS SWOOP—AND THEY DON'T HAVE TO WALK BACK UP

From the little house under the hill, a motor-driven endless rope pulls enthusiasts to the top of Jockey Cap at Fryeburg, Maine. The skiers on the track in the left center are riding uphill. Such devices, built on many of New England's most popular runs, save precious time for the exhilarating downhill plunge. At the left are the fast, tricky slopes for skiing; at the right, a toboggan slide.

guarantees its popularity as a mountain runner's paradise.

SPECTATOR TRAILS NOT FOR TYROS

I like to know that there are fast mountain trails handy, if I am having a good day. But many of the existing trails, despite the effort to classify them as "expert," "intermediate," and "novice," vary so much from day to day with weather and snow conditions that under certain circumstances even some of the novice trails will scare the beginner.

After all, how much multitude appeal is there in mountain trails with such reassuring names as "Hell's Highway," "Chin Clip," "Nose Dive," "Wildcat," and "Thunderbolt"?

Those are actually the names of five New England trails. They have spectator appeal. People would want to go and watch others risk their necks on them. Such names, however, have not the persuasive lure that attracts participants rather than spectators.

Obviously, if a steep mountain trail has plenty of turns, a skier will automatically slow down when he makes the turns, or in trying to turn he will fall harmlessly. In either case, he has killed the speed which can be so dangerous.

A mountain trail with such frequent turns would not be fast enough for Olympic-caliber racing runners; most of the New England down-mountain trails were laid out according to the preferences of racing men.

Fortunately, New England has not stopped with its down-mountain network. Skiing, like golf, requires facilities. And communities, sensing the winter business possibilities, have undertaken to provide suitable open slopes, woods roads, new connecting trails, slopes which can be floodlighted for nighttime skiing. They have constructed ski tows, American developments which pull the skier to the top of the hill and increase manyfold the amount of sliding down which one can do in a day (Plate VIII).

The snow trains, which brought 35,000 skiers to New England ski areas last winter, have created an interesting new problem. It is difficult for the New York, New Haven and Hartford Railroad, for example, to locate areas near enough to New York, for a one-day excursion train trip, where the snow is sure to be satisfactory and where the skiing terrain can accommodate thousands of skiers.

If only the people who arrive on the train had to be accommodated, that would not be so difficult, but the whole countryside seems to want to come and ski with the visitors (Plate VII and page 659).

The first regular snow train was run by the Boston and Maine Railroad from Boston in 1931. That winter these trains carried 8,371 passengers. Last winter they carried 24,240 passengers. Eighty percent of these passengers were skiers.

Being nearer the more mountainous section of New England, the Boston and Maine has a wider choice of one-day snow train destinations than the New Haven. However, New York has solved that problem by introducing the "week-end snow train."

Such trains bring even the highest mountains of New England into excursion range, Mount Mansfield in Vermont, Mount Washington in New Hampshire,* and, when the proposed skiing areas are completed, even Mount Katahdin in Maine.

Skiing has had a peculiar development in America. It was introduced originally by the Scandinavians, with whom cross-country skiing and ski-jumping were the vogue. Cross-country skiing did not capture popularity in America. Ski-jumping did develop here as a sport spectacle.

It was the development of mountain skiing in Switzerland † and Austria which suggested to New Englanders their own mountain possibilities.

NEW TECHNIQUE DEVELOPED HERE

The technique of central Europe was adopted here and our down-mountain trails were found suited to that technique. Subsequently, they have brought about an even more versatile technique, incorporating both the Scandinavian and central-European methods, plus new ones developed in the United States (pages 658, 662).

Today, cross-country skiing over mountainous regions seems to be the coming thing. A series of shelter huts was built in the White Mountain National Forest last summer, supplementing the Appa-

* See "Skiing Over the New Hampshire Hills," by Fred H. Harris, NATIONAL GEOGRAPHIC MAGAZINE, February 1920.

† See "Skiing in Switzerland's Realm of Winter Sports," 10 illustrations in duotone, NATIONAL GEOGRAPHIC MAGAZINE, March 1933.



Photograph by Winston H. Pote

OLYMPIC CONTESTANTS TRIED OUT IN TUCKERMAN'S RAVINE

The race was from the summit of Mount Washington, over the rim of the headwall, and down the sheer steeps to the "floor" (left foreground). Of the 55 skiers climbing the slopes (upper right) to the starting point, 41 were timed at the finish (page 645). The course required a careful turn on a 60-degree slope and a long traverse to reach the control flags at the left. This photograph was taken before the race began and before the big crowds had arrived in the ravine.

lachian Mountain Club trail cabins. Individual skiing trail systems have been linked together and mapped for touring.

A skier can start off now and pass several days or weeks covering new, interesting country. Even a difficult down-mountain trail gets tiresome if one runs it often enough. People like a change, the sense of progress. Lack of places to pass the night has hitherto slowed this development of the sport.

Anybody who has done mountain hiking in the summertime knows that high altitudes have their hazards. Winter multiplies them. Despite repeated warnings by authorities, skiers continue to take unwise risks in the mountains.

SNOWSHOEING HAS ITS DEVOTEES

Certain mountain areas and paths are open to the snowshoer and not the skier.

There used to be considerable friction at Appalachian Mountain Club meetings between the skiers and the older crowd, who swore by snowshoes and opposed having the club sponsor skiing. That opposition has disappeared now and many of the oldsters are enthusiastic skiers.

For extended mountain trips the wise ones carry snowshoes as well as skis and



Photograph by B. Anthony Stewart

SNOWSHOES ARE MAGIC CARPETS TO FAIRYLAND

After a light fall of feathery whiteness, a walk in the forest affords exhilarating exercise and deep satisfaction to the lover of unsullied Nature.

pack a pair of ice crampons just in case they hit icy going.

Sometimes more humble things than avalanches threaten the comfort of the wintertime mountain traveler. I often think of the adventure that befell my friend Winston Pote, the ski photographer.

Pote was making a trip to one of the A. M. C. mountain cabins with hutmaster Joseph Dodge. They arrived soaking wet from climbing.

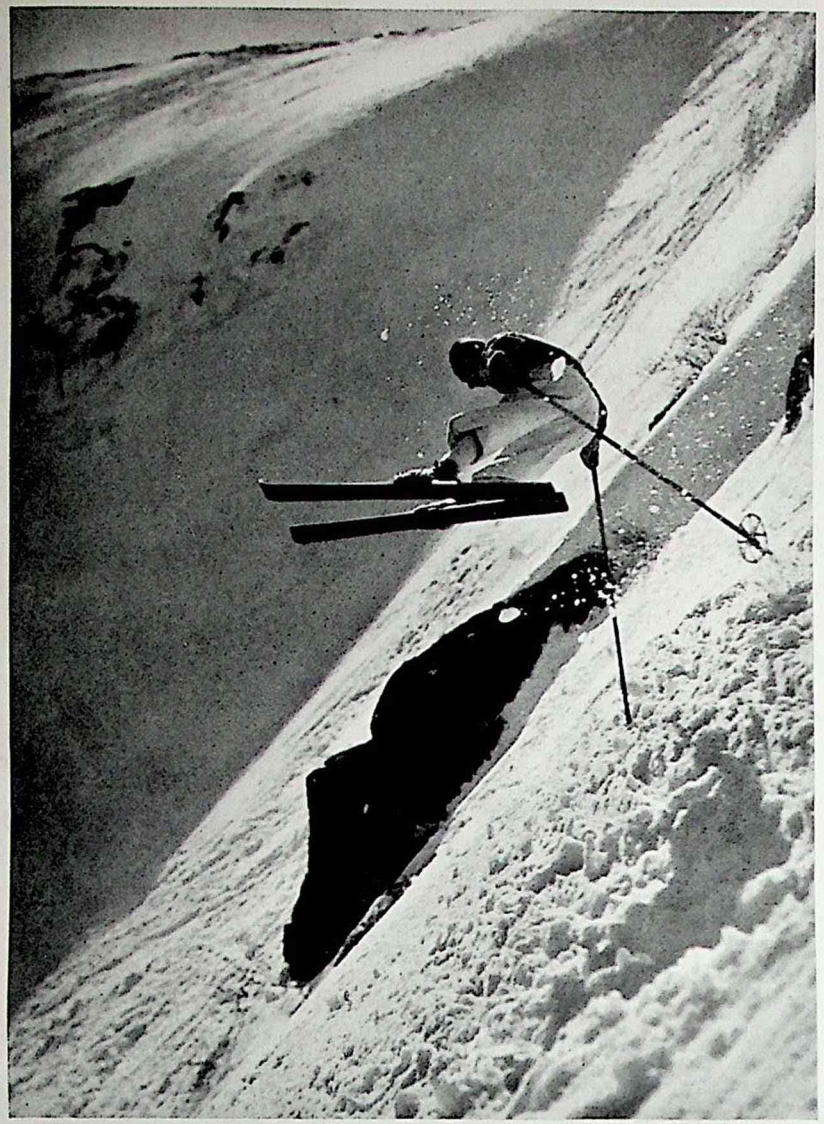
Joe put a frozen can of beans on top of the stove, put the coffeepot in front of the beans, then forgot about them. Win was drying out his clothes and was standing with his belt loosened and back to the stove, soaking up the warmth.

Suddenly the can of beans exploded, knocking the boiling pot of coffee over and pouring its contents upon Pote's back. Pote let out a bloodcurdling yowl and jumped clear to the cabin wall. It was a week before the blisters healed. The beans may still be seen, driven into the walls and ceilings, where they stayed and dried.

I have watched the thousands of skiers jamming Grand Central Station of a Sunday morning in New York. Non-skiers are amazed. "It's a fad. It can't last" (page 660).

WHY SKIING IS POPULAR

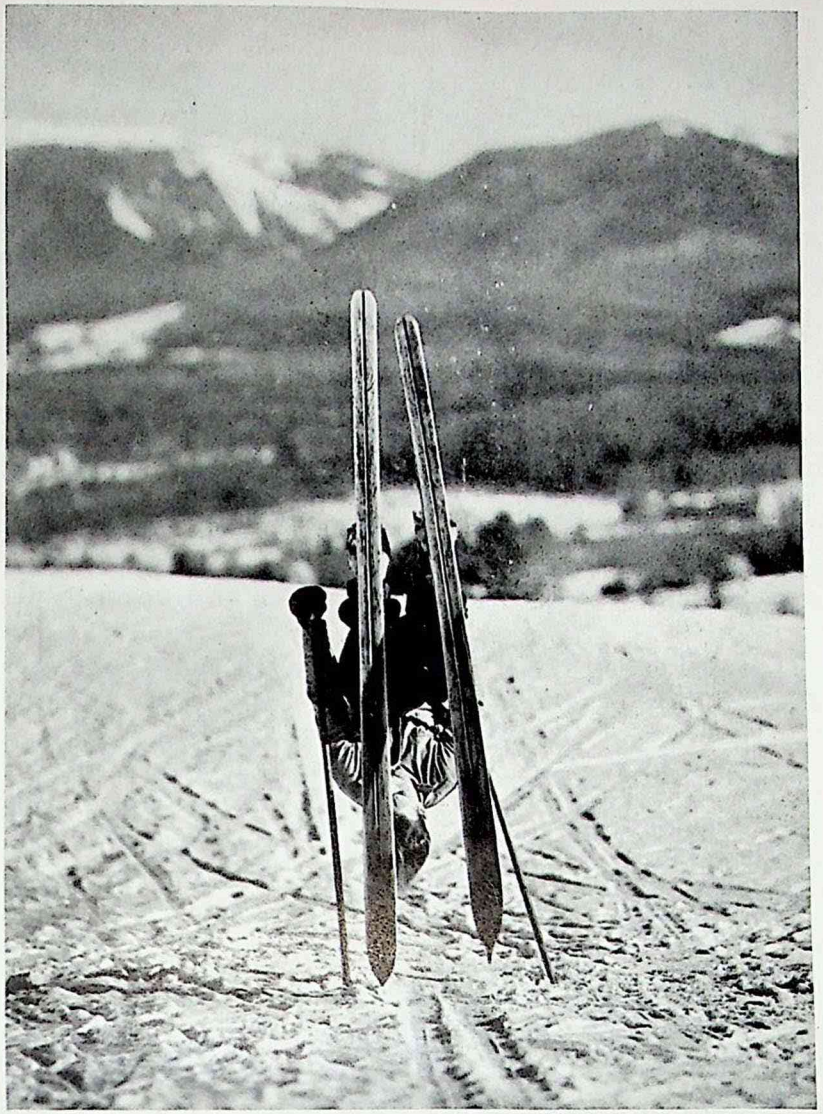
I think they are wrong. Skiing is real fun. It's a sociable sport, and healthful. Romance rides the snow train and romance



Photograph by Winston H. Pote

THE JUMP TURN AT THIS SPOT IS HAIR-RAISING

Only an expert should attempt such a feat as this on the north side of the headwall, in Tuckerman's Ravine, Mount Washington, New Hampshire.



Photograph by Roger L. Moore

YOU DON'T HAVE TO DO THIS TO SKI

An expert in the ski school at Pecketts, near Franconia, New Hampshire, executes a ticklish backward somersault. He is shown at the top of his turn.



Photograph by Acme

A CROWDED SNOW TRAIN UNLOADS ITS PASSENGERS AT NORTH CREEK, NEW YORK

In addition to Pullmans and coaches, there is an equipment car where one may rent any kind of gear, from skis to boots and bonnets. In 1933 a New York department store would not venture to buy harnesses for the 300 pairs of skis in stock; today it is estimated that 250,000 pairs are owned in Greater New York and New England. The sport is growing each year and promises to become to northern winters what golf is to summertime.



SKIERS, HOLIDAY BOUND, THRONG GRAND CENTRAL STATION

They are waiting for the snow train which runs on regular schedule to Pittsfield, Massachusetts. So rapid has been the growth of winter sports that travel to centers where they may be enjoyed now rivals the summer excursion crowds.



Photographs from Acme

"THE MUSHER" WON THE SCULPTURE PRIZE AT DARTMOUTH'S ICE CARNIVAL

To a bevy of coed guests of a fraternity at the annual winter fete at the college in Hanover, New Hampshire, the successful artist explains how he modeled the figures with a soldering iron and glazed them by using a blowtorch.



Photograph by B. Anthony Stewart

"OVER THE RIVER AND THROUGH THE WOODS"

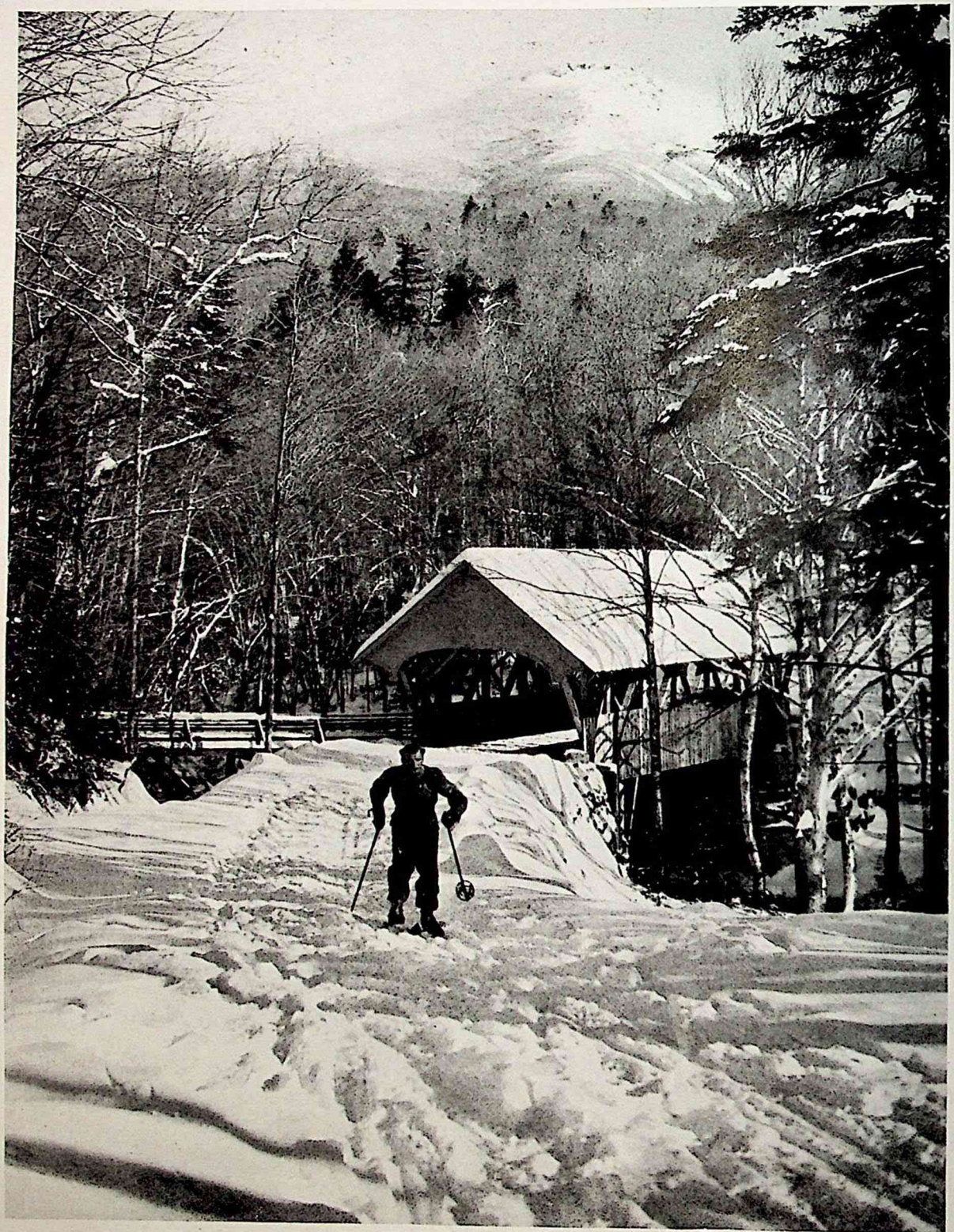
Passengers from the snow trains enjoy the sleigh and pung rides to hotels and other week-end accommodations in country that brings to mind memories of Whittier's "Snow-Bound." These merrymakers have just arrived at Intervale, New Hampshire.



Photograph by George S. Clark

READY TO HIT THE TRAIL AT THE CRY OF "MUSH!"

Sled races with dogs are becoming increasingly popular in New England winter sport areas (see text, page 664). This team from the Chinook Kennels won second place in an important meet at Plymouth, New Hampshire, last winter.



Photograph by Roger L. Moore

WINTER WEAVES ITS SPELL ABOUT THE FLUME TRAIL IN FRANCONIA NOTCH

With a good pair of skis and poles, a winter sports enthusiast climbs to the summit of a hill for an exhilarating run. Mount Liberty looms in the background. The foot of the famous Flume, where a brook cascades down rounded granite slopes, is just out of the picture to the right. In winter the water gurgles beneath heavily crusted pitches and an occasional open spot gives welcome liquid refreshment to the skiers.



Photograph by Harold Orne

A SNOW TRAIN PASSENGER RUBS EXTRA SPEED INTO HER SKIS

Waxing prevents running surfaces from "caking" in wet snow. At the right are two upended ski poles, showing the metal spikes at the tips and the leather-webbed rings that give purchase in soft snow. The mere male author surmises that natty costumes have something to do with the feminine vogue of the sport (page 646).

rides the thousands of skier-filled automobiles that take to the 14,000 miles of plowed highways which serve New England and its winter sports lands.

I have seen youngsters of eight and nine tackling mountain ski trails with safety and I know several excellent skiers, men and women, who took up the sport after their fiftieth birthdays. Skiing is occasionally strenuous, but it need not be violent. I believe it is a permanent development because it is a participant sport, rather than a spectator sport.

Ski-jumping, by contrast, is essentially for spectators. Viewed from below the take-off, the sport is tremendously thrilling. The take-off hill or tower enables the skier to build up terrific speed and shoots him out into the air above a steep lower hill down which he lands.

If he landed on a flat, he would probably injure himself. Landing on the slope, he strikes a glancing blow and then skis to a stop at the foot of the run-out.

"There's nothing to it," said one of my jumper friends as I stood at the top of the Lancaster hill.

"When it comes your turn, be sure your skis are tight, take a step or two to kick free any snow or slush, then bring your skis and knees together and crouch so low you are practically sitting on your skis.

"Ease over the crown of the hill and let her go, keeping your body low to cut wind resistance.

"As you near the take-off, raise your body easily to a chair-sitting position, leaning forward with your hands down backward by your sides. Gaze into the open space above the take-off jump, and the very instant before your skis flash over the edge of the abyss, spring upward on your feet and leap ahead into the air, diving upward. Swing your arms slowly like a windmill.

"Lean on the air with your body straightened out. Don't worry.

"As the hill comes racing up to smack you, wham your skis hard upon it, continuing to lean forward. In a second you'll feel yourself skiing again. Ride her out and make a conventional stop when you have slowed down enough."

I gazed down those narrow, slippery ski tracks to the place where the run ended and the air began, and saw the tiny lines of spectators waiting for the next victim. They seemed a mile away. There was one awful, imaginative moment when I thought I might; and then I realized with joy that I had no skis on my leaden feet.

I watched my friend streak away, a smaller and smaller dot on the run, blossom suddenly into a little flailing figure in the air, and disappear below the hill line.

The roar of the crowd echoed up the hill.

In a half minute the telephone tinkled and we had a reassuring report. He had landed badly, broken his ski and twisted his shoulder, but was able to walk.

New England's snow sports season runs from late December through March, with good spring skiing in the higher altitudes on into May. Snowfall averages 45 to 60 inches in south-central New England and increases to as much as 175 inches in the mountains. For 85 days between November 20 and February 24 last winter, the temperature on top of Mount Washington was continuously below freezing.

Skiing facilities include the regular bulletin services on snow conditions published in the New York and Boston newspapers on Fridays and Saturdays; published lists of trails with their classifications; ski-trail patrol on race days; Red Cross emergency caches and rescue toboggans at strategic points throughout the mountains; lighted ski slopes at Stowe, Vermont, and Laconia, New Hampshire; ice-cake enclosures for winter sun-bathing at a number of resorts; and many ski tows (page 655).

OTHER WINTER SPORTS LURE THOUSANDS

New England has many other joyous sports of winter. We have mentioned snowshoeing, which its enthusiasts term the prose of motion, as against skiing, which is the poetry of motion.

Sled-dog racing has begun to receive amateur support. Last winter 28 teams participated in eight races under the New England Sled Dog Club auspices (p. 661).

I added up the racing records of last winter in New England and if one driver and his team had won all the races, he would have covered 243 miles in 21 hours, 16 minutes, 24 seconds. That makes their speed about a mile in 5¼ minutes.

This winter the indoor winter sports carnivals in Boston and New York hope to stage pursuit races with these dog teams.

Skating is widely enjoyed, with publicly maintained rinks and skating areas available. Ice conditions in southern New England are too uncertain to permit regular harness horse racing on the ice or iceboating (Plate III). We have a racing club on the Mystic Lakes northwest of Boston and there is a fleet at Burlington, Vermont; but elsewhere only occasional iceboats are seen. Skate-sailing is more common.

Fishing through the ice, as practiced around Paugus Bay, on Winnipesaukee, and on Newfound Lake, in New Hampshire, is a popular pastime.

"Bobhouses" are built, small shacks with room for four persons, a table, and a stove. These shacks are on runners and are used either directly over a hole cut through the ice, or as shelter from which the fishermen watch their "tilts," gadgets which tilt and show a flag when a fish takes the bait at open holes out on the ice.

Harness racing on ice is popular in New Hampshire and Maine, and regular Saturday and Sunday races are run all winter. Horses are owned locally, and the owners usually drive. The racers are all trotters.

Toboggan slides, built of snow and sprinkled with water to ice them, are found where terrain and temperatures permit them (Plate I). Sliding slopes for children's sleds are provided by most communities.

And the old-fashioned winter sleigh ride in a big wagon box filled with hay, and with bells jangling, carries jolly parties down moonlit country roads to some inn for steaming chowder and a midnight barn dance.

Here and there skiers may be seen trailing a horse, sack stretched across the lines to keep the clods the horse kicks back from pelting the driver's face. This is skijoring.

North of Boston New England's sport planes take to skis in wintertime. Winter carnivals are held in almost every community at least once each year.

Thus, in New England winter has become a season of outdoor fun and recreation.

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FLYING THE PACIFIC

By William Burke Miller

THE trail-blazing Pan American Clipper, staked down in the open, undergoing general overhaul, was unnoticed by the crowd gathering at the water's edge at Alameda Airport. Even the triumphant China Clipper, back only three days from the first round trip to Manila, escaped attention.

For today the Philippine Clipper was due to hop off on the second airmail flight across the Pacific Ocean for Honolulu, Midway, Wake, Guam, and Manila.*

Apparently those who had crossed the bay from San Francisco this chill, gray December afternoon in 1935 had forgotten the achievements of these other two ships which had made such epochal flights as the one about to start a matter of routine (pages 668 and 678).

Standing alongside the gleaming Philippine Clipper, awaiting word to go aboard, Harold See and I, representing the National Broadcasting Company, could not readily forget the China Clipper and its crew. Originally scheduled to make the Pacific flight aboard her, we had flown in the China Clipper from Miami to San Francisco by way of Acapulco, Mexico.

LONDON TALKING—OVER CALIFORNIA

Flying between San Diego and San Francisco, we had participated in one of the most successful broadcast achievements thus far realized. Together with Captain Edwin C. Musick, we had chatted with Captains Albert W. Stevens and Orvil A. Anderson while they, in the *Explorer II,* were establishing a new world balloon record—ascending nearly 14 miles into the stratosphere over South Dakota.*

The four of us had been interrupted by a newspaper correspondent in London, who asked how the National Geographic Society-Army Air Corps stratosphere flight still could be under way when London had received word the balloon was ripped!

At the last minute we had been compelled to give up the plan of flying the Pacific in the China Clipper, as her mail load was so heavy she could not take us.

But today all our waiting and disappointments were over. Aboard this sister ship, the Philippine Clipper, See and I were to make the transocean trip. We would be the first persons, not employed by Pan American Airways System, to fly across the Pacific in the Clipper ships.

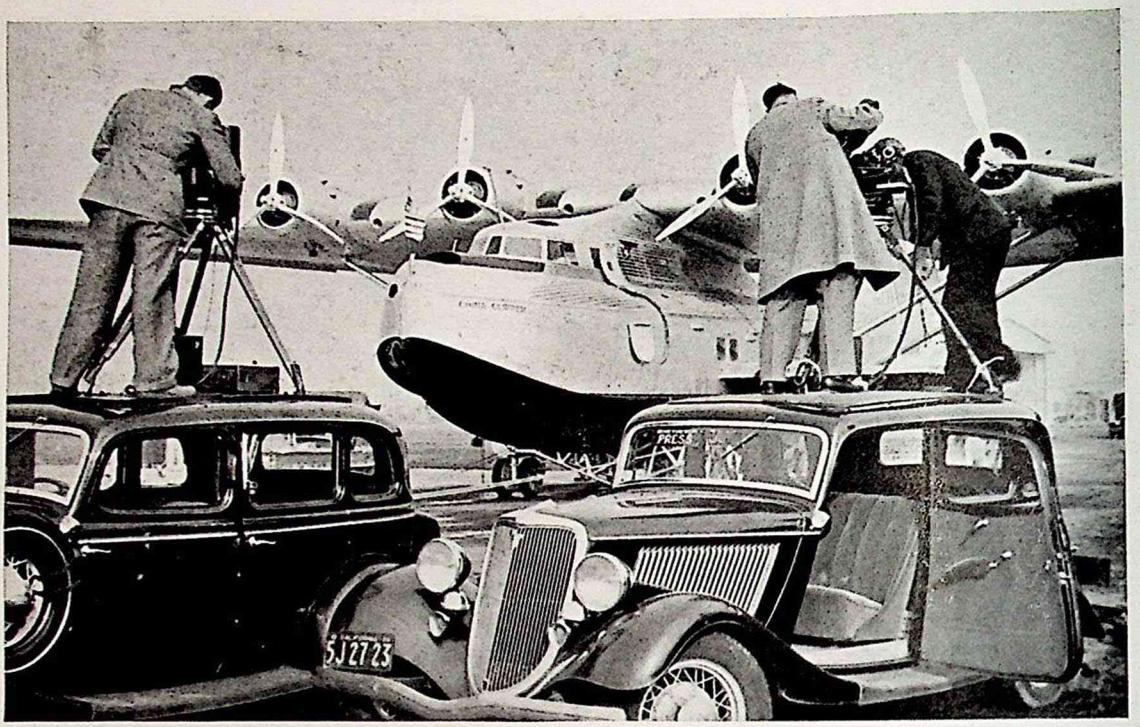
Our mission was to test the long-range dependability of portable, lightweight short wave equipment recently developed.

With See and myself and Louis Harmantas, meteorologist for Pan American Airways, our flight personnel numbered twelve. Harmantas was being sent to Manila to establish weather bureaus at the far end of the run.

We entered through a hatch in the after section. Inside we found that most of the seats and the beautiful furnishings had been removed. Mail sacks and parcels were tied down in several compartments.

* See The National Geographic Society's new map of The Pacific Ocean, with 73 border insets of important archipelagos and islands, sent to members as a supplement with this issue of their National Geographic Magazine.

* See "Man's Farthest Aloft," by Capt. Albert W. Stevens, National Geographic Magazine, January, 1936.



Photograph by Harold See

NEWSREEL CAMERAS GRIND OUT A CLIPPER CLOSEUP

Some 25 tons of China Clipper head for the water at Alameda, California, slowly towed on a wheeled cradle. Though she limps along on land like a crippled bird, she is speed itself in her elements—sea and sky.

This was not a regular passenger flight, for it was only the second time that a ship weighing twenty-five and a half tons had flown the Pacific. Not until twenty or more flights had been made would Pan American carry passengers on this route.*

The Philippine Clipper had been lightened as much as possible to carry additional gasoline. Engineers had studied and estimated the maximum required, but almost a third more had been added—a typical precaution.

Trim blue uniforms were being stored away in lockers, and white coveralls and furlined flying suits were being donned.

OFF FOR 2,400 LANDLESS MILES

Outside we could hear the operations manager giving last-minute weather and other information to Captain John H. Tilton, who was on the bridge. S. P. Crago, Junior Flight Officer, went aft and clamped down the after hatch. We knelt on mail sacks and looked out. The Philippine Clipper was loosing its moorings.

The outboard engine on the left wing coughed and came to life. A second later the outboard propeller on the right wing started spinning. It was just past 3 p.m. The crash launch sped ahead to the left of our course.

For a moment we seemed to be stationary, all four motors now idling. Then they opened up a bit and we were on our way. The corrugated surfaces of the sea wings left their pattern on the water, and the path slashed through the rough seas by our hull sent a white spume spraying fountain-like as our speed increased.

The whine of the motors rose to a higher pitch, the choppiness of the water was less noticeable. We were skimming along now on the step, only the tail surfaces in the water. The motors seemed to double in power and roar as they were steadily accelerated.

In the rear compartment, we were conscious of a slight twisting motion as though the choppy water refused to release the Clipper's hull and then, almost immediately, the splash of water against the windows stopped and we were in the air. Our

* On completion of these test flights, regular transpacific passenger service was begun by the Clipper ships on October 21, 1936.



A "GOONEY" TAKES OFF LIKE A HEAVILY LOADED PLANE

Though it has a wing-spread of several feet, the heavy bird has to taxi along the beach on foot to pick up flying speed. At Midway two distinct species are called "goonies"—the black and white Laysan albatross, which is friendly, and the black-footed albatross, which may give a man a vicious peck (pages 686-7).*

take-off, fully loaded (51,000 pounds), had required 45 seconds.

Slowly we climbed in a widening circle and, as the land fell away, wispy clouds moved in to greet our ascending craft. The dull metal of the Clipper blended with the misty grayness of the sky. We were a part of the atmosphere.

THE SONG OF THE MOTORS

A low ground haze hid San Francisco from us as we straightened out several thousand feet up. The sun made an effort to smile in salute, but the gray clouds frowned him down.

The hum of the motors changed. For a moment they seemed out of synchronization and their voices died to a murmur. Then their song became a solo—strong, but with a softer tone. We were now flying with the motors at long range cruising speed and the change in the pitch of the propellers had reduced the roar.

Off Point Bonita, we passed out to sea. This was to be our last sight of land until we reached the Hawaiian Islands—some 2,400 miles off the nose of our Clipper. The sea was empty and, save for us, so was the sky. We were out in a dull void between sea and sky with only the song of our purring motors to comfort us.

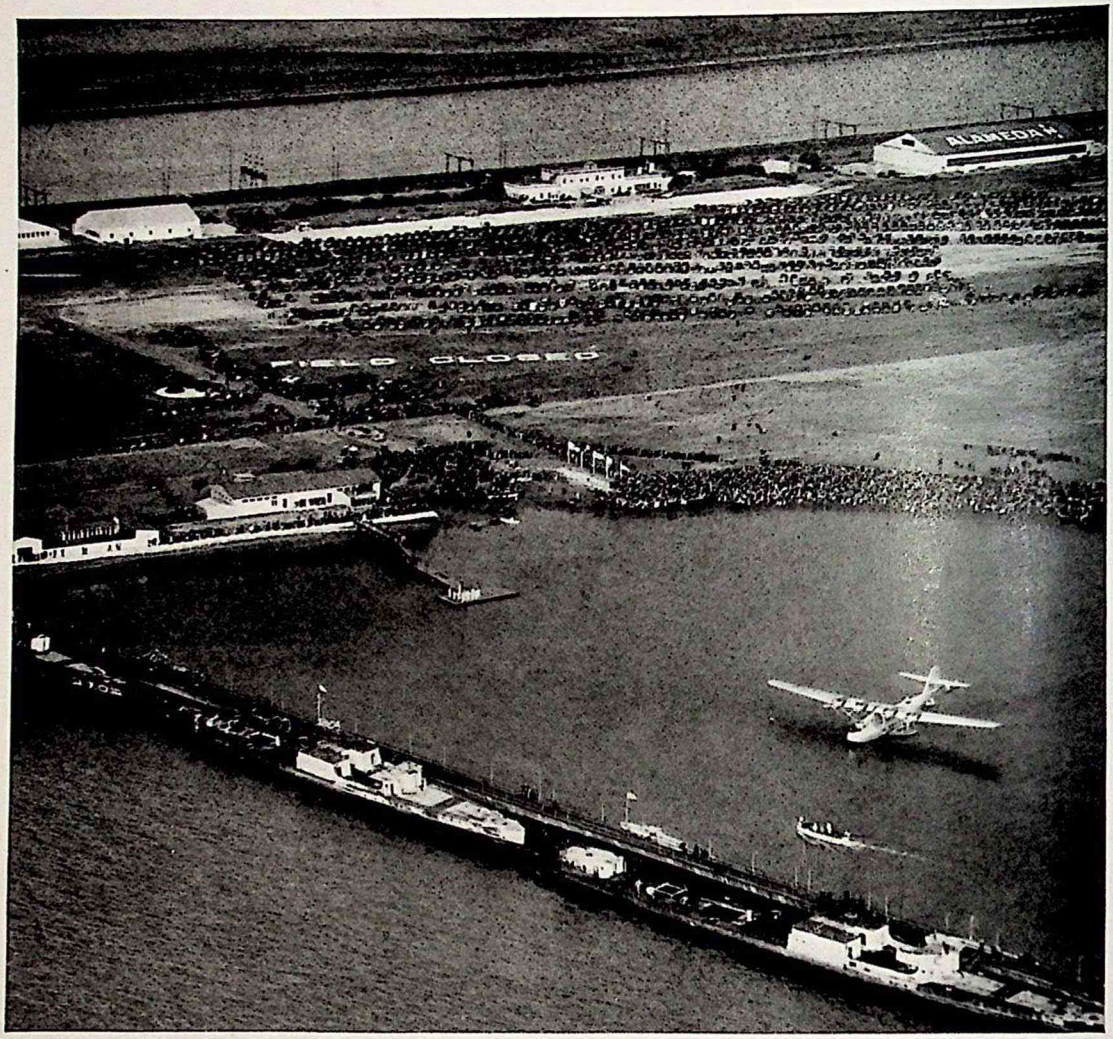
Harmantas was studying cloud formations and checking them against weather reports, including data brought back from the flights of the Pan American and China Clippers. Watching him, we realized weather forecasting was no form of black magic or expert guessing, but a careful accumulation of a vast amount of information over long periods of time.

AN EMPTY SEA, AND THE NIGHT

Now we were flying at 8,000 feet and the atmosphere was clearer. The rays of the setting sun finally broke through the clouds and the wing tip of our silver Clipper was etched in red-gold against the sky.

The sun dropped rapidly after that brilliant moment, but our ship was still glossed in rich purples that dulled gradually to deeper tones; then came a last bright flash

* Photographs not otherwise accredited are reproduced by courtesy of the Pan American Airways System.



Photograph by Clyde Sunderland

AVIATION HISTORY IS MADE AT ALAMEDA AIRPORT

With hundreds of cars parked on the flying field and spectators gathered at the water's edge, the China Clipper is about to take off on the first round trip to Manila by way of Honolulu, Midway, Wake, and Guam, November 22, 1935. This flight, on which a load of mail was carried, marked the beginning of commercial air service across the Pacific Ocean, though regular passenger flights did not start until October 21, 1936 (page 671).

from the sun as we climbed higher, and it was dark—night had come.

T. R. Runnels, Communications Officer, came aft. He was releasing the ship's antenna to Harold See for our first broadcast. The antenna was reeled in and out again to the length required by the wave length assigned to us.

See sent out his call—"WOEH aboard Philippine Clipper calling—hello RCAC, Point Reyes" (California). He was wearing earphones, but his smile told us that his call was answered.

We went forward and obtained our position and approximate speed from Judson Ingram, First Navigation Officer. The microphone was brought out to the roomy lounge amidships where most of the seats had been left.

Captain Tilton was drinking coffee. He is a finely built man of normal height, with a slim trimness of bearing that suggests early and regular physical training. He does not like the idea of talking before the microphone and smilingly he declines.

Ingram and Harry Canaday, Second Navigation Officer, move from their chart table in the compartment just in front of the lounge. They too urge the Captain to speak.

From the rear, See is waving to us. He holds up his hand—the sign to stand by. We look out at the darkening night.

What words have we to describe what we feel, what we've experienced and seen? How can we adequately picture the sense of aloneness, of exhilaration, of awesomeness, of safety—now that we are flying the Pacific? See drops his hand and we are on the air.

Captain Tilton is watching, listening closely. Something we say pleases him and he nods approvingly. We sit down and talk to him and in a moment a question has been asked and he has answered it. Ingram and Canaday grin. The Captain's twinkling eyes wink, though he shakes a friendly fist, and our broadcast is under way.

We are 381 miles from Alameda and flying at 8,000 feet.

Captain Tilton, easier now, tells us his home is Washington, D. C.; that he served with the Navy during the war and has flown the Caribbean route of the P.A.A. for seven years. Yes, he flew the S-42, the Pan American Clipper, to Wake Island and to Guam. He is delighted to command one of the larger ships and to have Captain Dahlstrom along to give him the feel and lift of the new Clippers.

He declines to estimate the time of our arrival at Honolulu.

And so we talk on, looking out the windows as we fly, hoping to sight some light on the water. See comes forward, pointing to his watch. We've been on the air fourteen minutes. It's time to sign off.

Point Reyes reports excellent reception. Runnels hurries forward. He needs the antenna now to make a regular contact with Pan American bases. Our next broadcast is two hours away and we decide to visit the engineering officers' cabin.

NAVIGATING WITHOUT A LANDMARK

To reach this part of the ship, we must pass through the navigators' compartment. But this is no time to bother them. The hop between Alameda and Hawaii is the longest leg of the flight, 2,404 miles, and there is not a single landfall to check on between the United States mainland and the islands. Throughout the night, they will study the stars.

Runnels, at his radio, will obtain radio bearings from Alameda behind us and from Makapuu Point (Oahu, Hawaiian Islands) far ahead, as well as other points. Periodically he will pick up ships' signals and obtain their position, thus helping the navigation officers to determine our own. All in all this will be a busy night for the crew.

With nothing in sight but clouds, and, at times, dark water, it seems a bit incredible to see the navigators look at the chart, check the time, and quickly scribble down a position, giving latitude and longitude and translating the distance we have come from nautical to statute miles for our landlubber minds.* But, somehow, we are confident that they know where we are.

The quiet roar of the motors is a comforting sensation. Hour upon hour their song is the same, though changing slightly in volume as the Philippine Clipper ascends or descends at the pilot's will, to take advantage of more favorable winds at various altitudes.

A door shuts off the flying bridge from the rest of the ship. Opening this, we come upon a short ladder and clamber up. The noise is higher in here; a side window is open. It is inky black, but the glow of many luminous dials on the instrument panel silhouettes two figures who sit there comfortably. Their eyes are alert, their heads turning occasionally to left or right, but in the dim light we see their hands are folded—neither has his hands on the controls.

A ROBOT FLIES THE SHIP

We recognize Captain Tilton in the left seat. He is on watch, in command. Captain Ralph Dahlstrom, First Officer, is flying the Philippine Clipper with his hands in his lap—and we are on a 2,400-mile flight across water!

Dahlstrom, sensing our questions, smiles at us and points to a replica of a plane on a dial. Its wings dip left or right ever so slightly to the motion of the Clipper.

We lean down to Dahlstrom. He shouts into our ear: "We're using the automatic pilot."

The Sperry mechanism that has won over even the most self-sufficient pilot was flying the Philippine Clipper across the Pacific, though a crew of nine men was aboard.

We move from our cramped position behind the bridge and, passing Runnels' radio desk, climb up and crawl back to the

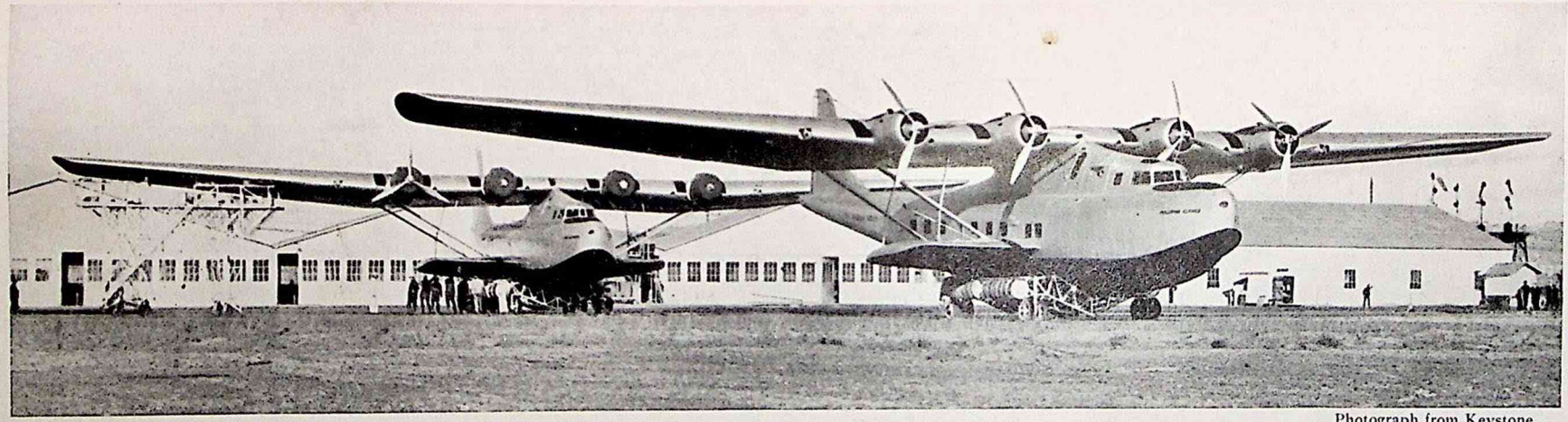
* All distances given in this article are in statute miles.



Photograph by Clyde Sunderland

SAN FRANCISCO, END OF THE OLD FRONTIER AND BEGINNING OF THE NEW

Sky pioneers of the Pacific now wing their way over tall towers and bridges on their way out of the Golden Gate. Pan American's Alameda air base, home port of the sky-going Clipper ships, lies across the bay to the right. The new San Francisco-Oakland Bay Bridge, one of the world's mightiest over-water structures, links Oakland in the distance with San Francisco by way of Yerba Buena. At the left, toward the waterfront and the tower of the Ferry Building, runs Market Street.



Photograph from Keystone

SISTER SHIPS OF THE TRANSPACIFIC SKYWAY AT THEIR HOME PORT, ALAMEDA, CALIFORNIA

Aboard the Philippine Clipper (right) the author made the flight to Manila and back in December, 1935. At the left is the China Clipper.



Photograph from Wide World

"CAN SUCH A BIG MACHINE REALLY FLY?"

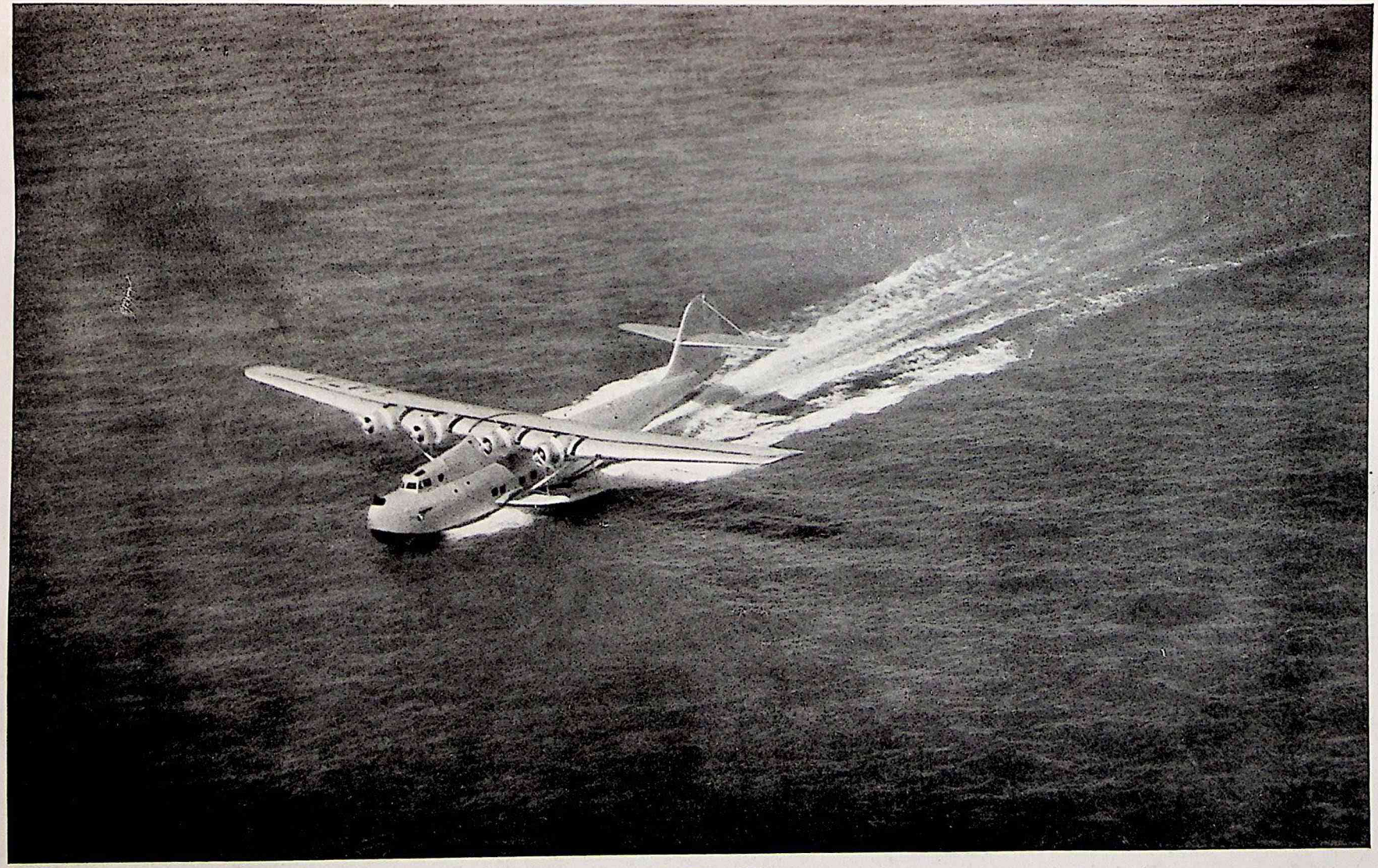
Bystanders exclaimed in wonderment as the China Clipper in its cradle was wheeled out on November 21, 1935, and poised to enter the water for the start of the first transpacific airmail flight the following day (page 668). Mechanics clamber over the plane, making final inspections.



Photograph by Gabriel Moulin

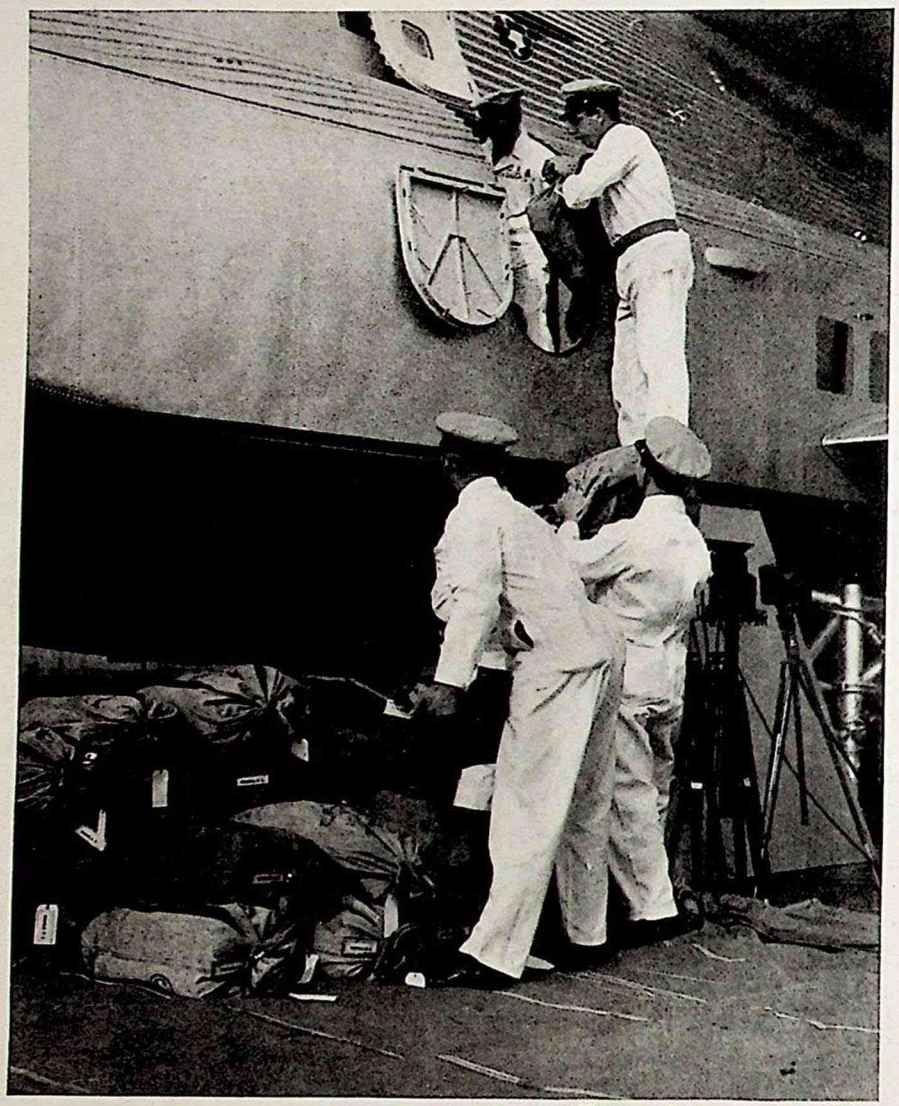
THE FLEET'S IN: WARSHIPS ANCHOR IN A GLISTENING FRAME PROVIDED BY THE NEW SAN FRANCISCO-OAKLAND BAY BRIDGE

Along the docks, where ships from Hong Kong, Melbourne, Hamburg, New York, and ports the world over put in, runs the Embarcadero, San Francisco's wide waterfront boulevard. At the right is the tower of the Ferry Building, and out in the bay are ferry boats plying like waterbugs to Oakland and other bay points.



OFF FOR THE ORIENT!

The China Clipper, here taking off, is one of three giant Martin flying boats capable of carrying 30 passengers—in addition to a crew of seven and a heavy mail load—on all except the 2,400-mile hop between San Francisco and Honolulu. Even on that long over-water jump it can take from six to a dozen passengers, depending upon their weight and the amount of mail.



Photograph from Pictures, Inc.

FOR 75 CENTS YOU CAN SEND A HALF-OUNCE LETTER TO THE ORIENT BY AIR

This mail being stowed aboard the China Clipper will reach Manila in a week or less, instead of the three weeks required by fast steamer. Mail sacks were used as impromptu bunks by the author and two of his companions on their Philippine Clipper flight, when regular passenger service had not yet begun and berths were not available (page 677).

"throne room of the God of Gadgets," as the airport mechanics call the engineer's cabin. This triangular space is formed by the struts and framework where the huge wing and hull are blended (page 675).

Lanky John Fiske, First Engineering Officer, is lounging in a bucket seat, strapped in. A clip board is on his knees and he has difficulty finding a comfortable position for his long legs. The Junior Engineering Officer, E. B. Abarr, is sitting on the floor.

There is no room for us in these cramped quarters, but we kneel there a while, watching as Fiske reads dial after dial and makes notations on the sheets of his clip board. Any change in the operation of the Clipper is recorded here.

From time to time Fiske points a huge flashlight out the right and left portholes, playing the beam on each motor nacelle, on the propellers and wing surfaces. As the flashlight snaps off, we notice the dull red of exhaust pipes that add color to the night, and far out on the wing we see the red and green flying lights marking the right and left wing tips.

The "throne room" is the heart of the Clipper ships. The bridge forward is the brain.

As we crawl forward toward the bridge, we are conscious of a brightness outside—not daylight, but a luminous brilliance.

We clamber down the ladder and return to the lounge. During our inspection the Clipper has been climbing. Now the clouds are below us. Directly astern, riding our tail, is a full moon. Its rays gleam on the cloud banks beneath and they give off a reflected silvery light. It seems as bright as day, but the light has a screened, softened effect.

We are at 11,000 feet and for more than

an hour this silvery brilliance illumines our course. Occasionally we see a "moon bow" encircling the shadow of our Clipper on the clouds below.

Then, almost as if someone had snapped off a bluish light, the silvery radiance has gone and we are looking down on black water, made oily by the rays of the brilliant new moon still riding high behind us.

A SHIP THAT PASSES IN THE NIGHT

It is 8:15 in the evening, Pacific Standard Time. We have been on our way five hours.

Runnels comes through the lounge and tells us we are due to overtake the SS. *Maunalea,* which is on our course. All press cheeks and noses against cold window panes as we look up and down the ocean, hoping to be the first to make out a light on the blackness below.



"THRONE ROOM OF THE GOD OF GADGETS"

Thus the airport mechanics often refer to the engineer's cabin, the heart of a Clipper ship. In this small triangular space with its bewildering array of gauges and other mechanism sits the engineering officer, reading dial after dial, jotting notes on the sheets of his clip-board, and communicating with the bridge by telephone. Any change in the Clipper's 3,600-horsepower pulse beat is recorded here and from time to time the officer peers out the windows beside him to inspect the four huge motors (page 674).

Small cloud banks pass beneath us, momentarily shutting out the water, but soon Runnels and Ingram sight the vessel just under our starboard wing and Ingram hurries forward to mark the time and to add this one visible check to other position reports.

The ship's passengers evidently are unaware of our passing, for no searchlight beams pierce the sky. We feel a vague disappointment. Somehow we had expected to exchange greetings. Soon, however, we lose sight of the ship. It has days to go. We'll be in Honolulu tomorrow for lunch—or sooner. There is smug satisfaction in the thought and we forget the *Maunalea* in the beauty of the night.

Harry Canaday goes aft to take a celestial reading—shooting the stars. We follow him. Canaday opens the hatch through



HONOLULU CITIZENS FLOCK TO SEE THE CLIPPER NAMED FOR THEIR ISLANDS

The Hawaii Clipper is the ship on which H. R. Ekins flew home from Manila, beating two other reporters in a recent race around the world.



SUCH IS LIFE ON A DESERT ISLAND!

Instead of living like Robinson Crusoe, aerial wayfarers spending the night at Wake find all the comforts of home in this hotel—plus a few additional ones. The nearest automobile horn and flat-wheeled streetcar are several thousand miles away. From faraway San Francisco by steamer came the sleek metal furnishings finished in walnut, the lamps, bedding, curtains—everything, in fact, from an electric generator to a pillow case (page 696).

which we had entered. It is open directly to the sky. A shield locks into place, but the wind sucks through the opening and it is bitterly cold. The full moon looks squarely down into our faces—as far away as ever, but surely seeming to follow us and keep us company.

We grow cold and with Harold See go forward to the galley for something to eat. But at this high altitude we are conscious of a chill that hot coffee and soup will not warm. Stripping the Philippine Clipper of all non-essentials for this experimental flight has included part of the heating apparatus, we learn. The crew have fur-lined flying suits, but we broadcasters and Harmantas are not so equipped.

ASLEEP ON THE DEEP—AMONG MAIL BAGS

We pile on sweaters and overcoats, but these do not help. We do not want to sleep our first night over the Pacific, but it is too cold to sit about. Going back through the compartments piled with mail sacks, all three of us suddenly get the same thought. Without a word, we begin burrowing down under the canvas mail sacks.

Paper in bulk is warm and, though none of us intended to sleep, daylight was not far off when we awoke. We had spent five hours sleeping under and on the packages and letters from all over the United States for loved ones throughout the Orient.

The sky was ugly, not dark but not yet light enough to be day. The moon was still in the sky, but no longer behind us. Over us the sky was hazy; below it was a solid overcast of clouds. The eastern horizon was reddening dully. The entire scene was depressing.

Stiffly we moved forward to the lounge. Runnels and Max Weber, Second Flight Officer, were sleeping now, hunched down in their flying suits. In the navigators' compartment Ingram was sitting, not asleep but with his eyes closed. Canaday was at the chart table, his eyes red-lidded and weary. Neither of them had slept during the night.

Captain Tilton was eating in the galley. He had cat-napped only a few hours, but his eyes were bright. His smile warmed us, dispelled the gloom. We joined him drinking coffee and asked how far we had come. He stepped to the chart table, looked over Canaday's shoulder and noted the last mark. We were 572 miles from Honolulu and had flown 1,840 miles from Alameda during the night.

Outside it was clearer now; warm pink rays of the still invisible sun pierced the darker blood red at the horizon. The colors from the first rays were magnificent, hardly definable in their rapid and seemingly endless procession of change from pale pink pastels to deepening gold until the sun itself burst forth in blinding brilliance.

By our watch it was 8:15 o'clock, Pacific Standard Time.

A while later Runnels handed Captain Tilton a radio message from Honolulu, placing us 287 miles from Pearl Harbor.

The Clipper was in no mood to tarry. Her motors were not tired and their song was the same as it had been since our take-off. Billowy clouds were everywhere and the water was not visible often.

We flew on.

HAWAII THE FIRST LANDFALL

Captain Tilton came off the bridge again and said we should be sighting Mauna Kea, rearing up 13,825 feet on the island of Hawaii. All eyes were ahead. We could see nothing but clouds and more clouds. Captain Tilton was the first to speak. It was 10:08 Pacific Standard Time.

"There's Mauna Kea just west of south of us."

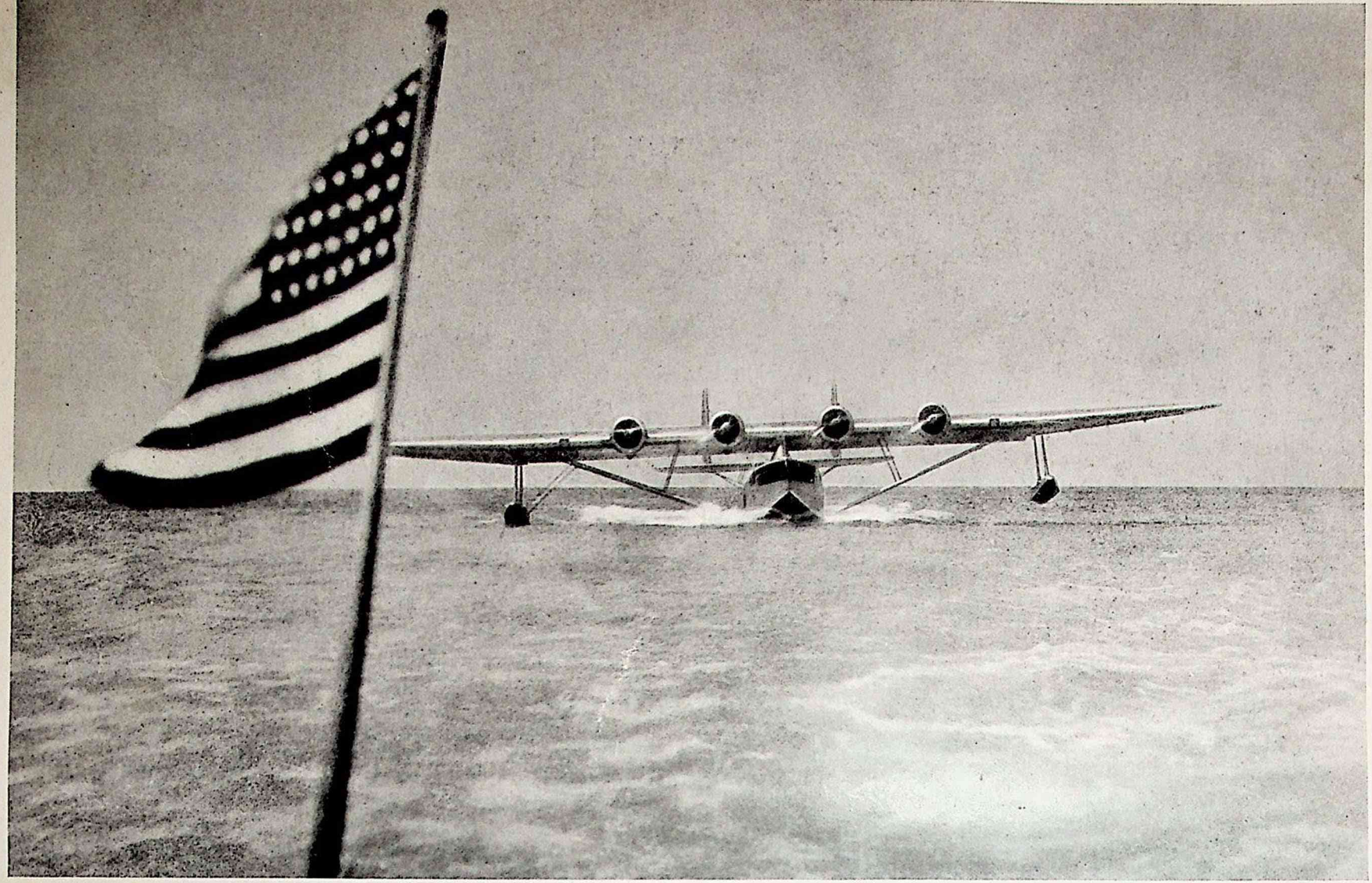
Ingram sighted it immediately. Canaday confirmed it and from the bridge there was a signal that a landfall had been made. We could see nothing.

Finally, with the Captain's finger making it out for us, we saw a slightly darker haze amidst billowy clouds. There was Mauna Kea, but a landlubber would have passed it by. Only the practised eyes of these air mariners would recognize it as land.

Our longest over-water jump was done, but Diamond Head lay nearly an hour away. This hour seemed endless. Those in the crew off duty were shaving and changing back to blue uniforms. We awaited our turn to freshen up.

After a while we began to descend, slowly, not for a landing but to get below the cloud bank. Cautiously we let ourselves down and far ahead loomed lower peaks. Under the cloud bank it was dreary and moist.

As we came lower, it was noticeably warmer in the Clipper. The sudden change seemed oppressive. Then, just off our right



BLAZING AN ALL-AMERICAN TRAIL ACROSS THE PACIFIC OCEAN

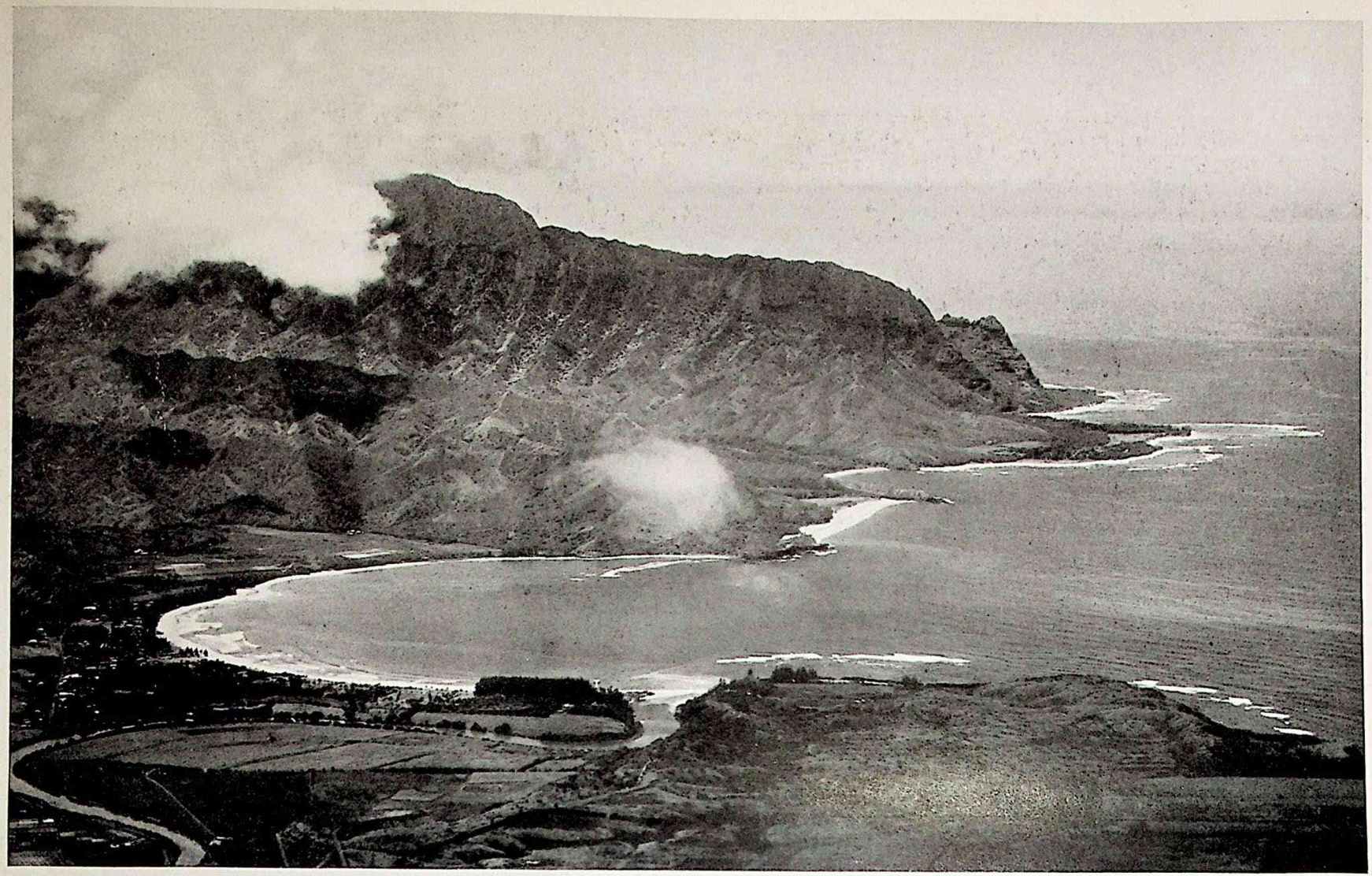
Pioneer of the new route was the Pan American Clipper, called "The Flying Gas Tank" by those who knew her best. She made the first flight for so large a ship, 18 tons, from the mainland to Honolulu and back. Then she blazed the way to the island bases of Midway, Wake, and finally Guam, returning to San Francisco each time and taking different officers so that crews might be trained. This veteran Sikorsky with its pontoons can be distinguished at a glance from the much larger 25½-ton Martin-built ships being used in regular service—the China, Philippine, and Hawaii Clippers (pages 671, 673, 676, and 682).



Official Photograph U. S. Army Air Corps

HONOLULU IS NOW ONLY A "SLEEPER JUMP" FROM SAN FRANCISCO, 2,400 MILES AWAY

The author left Alameda Airport, California, by Clipper just after 3 o'clock one afternoon and reached Hawaii about breakfast time the next morning. On the longest over-water hop on any air route in the world he calmly slept amid mail bags (page 677). The docks and business section of Honolulu appear at the left, beyond the harbor. Like a crouching lion (upper right), lies the extinct crater of Diamond Head, where the homeward bound Clippers pass out to sea (page 706). In a curving indentation just this side of Diamond Head is the world-famed beach of Waikiki.



Official Photograph U. S. Army Air Corps

KAUAI, "THE GARDEN ISLAND," IS A PARADISE OF PINEAPPLES, SUGAR CANE, CANYONS, AND BEACHES

Fourth largest of the Hawaiian Islands, it lies athwart the Clipper route from Honolulu to Midway. Its ancient volcanic heights have been weathered into deep gorges which suggest miniature Grand Canyons (page 683). "The soil," observed the author, "is a deep, rich brown and where there is no foliage it has a reddish purple cast." The central parts of the island, seen from the air, seemed "chocolate-covered mounds of pistachio ice cream, melted down." One of the finest beaches in the Territory of Hawaii is here, in the curving sweep of Hanalei Bay.



Photograph by J. J. Todd

A RUINED AND HALF-DROWNED VOLCANO STILL REARS A ROCKY CRESCENT ABOVE THE SEA

Between Maui and Kahoolawe in the Hawaiian Islands lies the barren, broken crater of Molokini, like a writhing sea serpent turned to stone. Atop its curving, craggy spine stands a guardian lighthouse, a mere pin-point in this aerial picture.



130-FOOT WINGS OVER THE PACIFIC

The China Clipper races a phantom plane, as fleet and as huge as itself. Except for a shadow cast on water or clouds, the Clippers are usually alone in a lifeless void between sea and sky on their long flights over the largest of oceans, as ships are sighted only at rare intervals. Flying high in the light of the moon, passengers sometimes observe a "moon bow," a luminous ring encircling the shadow of the ship on the clouds below (page 675).

wing tip, was land—we were nearing Honolulu. The earth was rich brown, coppery, the foliage verdantly green.

We were surprised at the mountainous appearance of the islands. And the white foam at the water's edge as it broke against the shore told us it was a rocky coast below. As we dropped lower, wispy clouds swirled around us—and ahead was Honolulu (page 679).

We looked at our watch. It was just 20 hours and 14 minutes from the time we had taken off from Alameda Airport.

Captain Dahlstrom was dropping lower, scanning the scene below, then speeding the Clipper, surging us up into the sky as he sought more altitude. Both he and Captain Tilton were at the controls. Tilton, having landed here several times before, was showing Dahlstrom the course and pointing out obstacles.

We flew low over land and could make out people waving to us. The Clipper was out over the water again and a number of Navy planes from the base filled the sky to the right and left of us. One or two zoomed in closely, apparently taking pictures. Each pilot waved in salute as he dived under or above us. The Clipper maintained a steady course.

Just over the naval air station, we turned and started to come in. Lower and lower we flew. The motors were louder now, tuned to emergency or take-off position. These great ships must not be out of control at take-off or landing. Down we glided. Everyone was sitting in his place. We hovered for seconds over the water. Now that we were below the horizon we saw that we were moving swiftly.

Swoosh! Water splashed against the windows and our first leg was done. Alameda to Honolulu, after lunch and before breakfast. It was 9:15 a.m. locally—11:45 a.m. Pacific Standard Time.

As we taxied inshore and were towed to the dock there was scarcely a wave of a hand or a murmur from anyone. But the instant the crew, led by Captain Tilton, appeared through the after hatch there was a sharp, explosive round of applause as if a cue had been given.

Then all aboard were decorated with flower leis. The quietness and restraint, yet the lovely gesture, impressed us all.

It was a drive of several miles into Honolulu proper, over narrow, winding roads. The Captain suggested we get some rest and we should have done so, but no one seemed anxious to sleep.

Visiting the more familiar landmarks in Honolulu occupied most of the afternoon, but everyone returned to the hotel for dinner and retired before ten o'clock. Stand-by was set for 4 a.m.

It was moist and dark when we were called. Breakfast was waiting, and lunches and vacuum bottles for our flight to Midway had been prepared. Without delay we ate and were on our way to Pearl Harbor. Arriving at the base, we found the Philippine Clipper moored offshore, her riding lights agleam. The water suggested a mill pond; it was without a ripple. Dawn was half an hour away.

THE SMART CLIPPER BECOMES A FLYING FREIGHTER

We found that all the attractive furnishings had been re-installed while we were at Honolulu, but onto these had been piled foodstuffs of all sorts for Midway and Wake. Fruit and vegetables, packing cases and other bundles, together with the combined odors, suggested the back room of a country general store. The smart Philippine Clipper was flying freight.

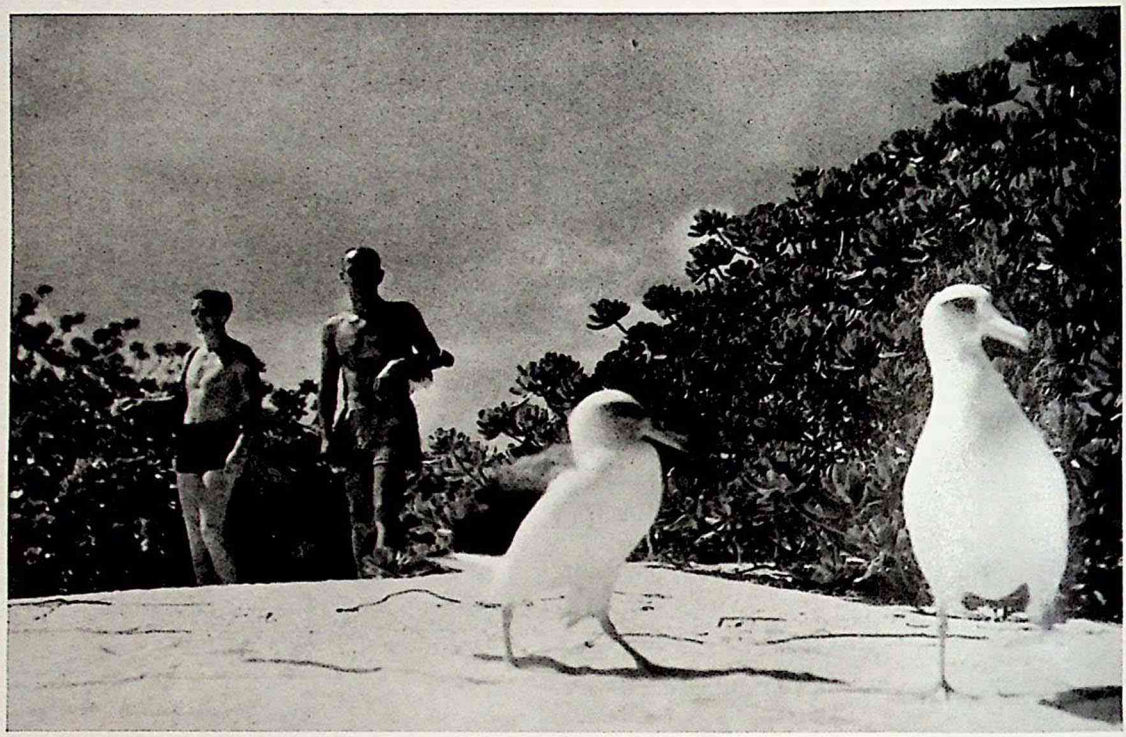
With difficulty we found a place to sit. Two more had been added to our personnel, bringing our total to fourteen. We were returning one man to Midway and taking another on to Wake.

Now all motors were warming and we skimmed along the water. Locally it was 6:22 a.m. Midway was 1,304 miles away. The breeze had freshened and the sky was lighter. The deeper growl of the motors caught our ears; we were starting the run for take-off. I checked my watch.

Faster and faster we raced—not much splash on the windows here; the water is too smooth. We were hurtling now and the motors were ascream. The land dropped away; we were off in 47 seconds.

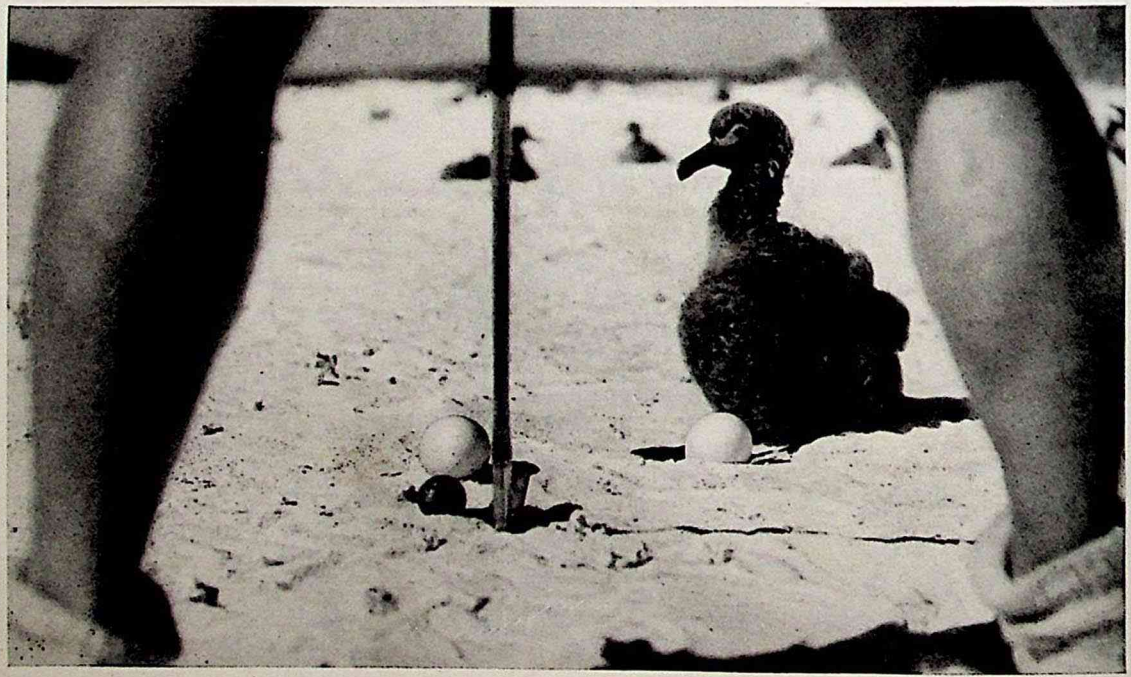
We turn to our new flight companions. One is asleep, but the other is peering out the windows, his beady eyes glowing. He is a short Hawaiian, about forty-five years old. It is his first flight, he says, and his first trip to Wake Island. He is an expert dynamiter and is going out to blast coral heads from the lagoon there.

This leg of the flight is not so barren of interest as the others. There are several islands along the route. Soon, on the right, we are passing the island of Kauai. Several



A MIXED FOURSOME ON MIDWAY'S "GOONEY GOLF COURSE"

What the penguin is to Antarctica the gooney is to the Midway Islands. This comical bird, as big as a goose, is unafraid of man; often two or more follow the golfers, clacking their bills companionably and rubbing their heads against the men's legs. Players get plenty of practice with the niblick, as the impromptu links is one big sand trap.



"BE SURE YOU HIT THE RIGHT BALL, MISTER"

Will it be a good iron shot or a badly scrambled egg? The young gooney looks a bit worried. But players are careful not to harm the birds, which are assured sanctuary here at Midway by the United States Government. Cats and dogs are not allowed.

of the gorges suggest miniature Grand Canyons. The soil is a deep, rich brown and where there is no foliage it has a reddish purple cast (page 680).

Just beyond Kauai, to our left, we see Niihau, but most of it is hidden by low-lying clouds. The sun is bright and the clouds below us resemble huge puffs of cotton.

RAIN OBSCURES THE SEA

Before we realize it we are in a squall and rain shuts out the sea from our sight. The air is rough, but except for an even rise and fall, there is no sign that we are being buffeted.

Still it is a different sensation from the steady, even riding we have experienced thus far and, recalling that it is the first flight for the little Hawaiian dynamiter, we look over at him to see how he is taking it. With a blanket drawn over his shoulders, he is sleeping, completely relaxed.

We were in the squall for more than two hours and did not see any of the other islands that were on our course.

A number of times Captain Tilton climbed the sky to 11,000 or 12,000 feet seeking more favorable winds, but finally we dropped to within 1,500 feet of the water where the air was smoother and we seemed to make better time.

Occasionally now we could see the water, the whitecaps, noticeable from this height, indicating the sea was running high.

Life on the Clipper was calm. At one time Captain Tilton was reading a newspaper in the lounge during his off-watch period. At another, Canaday and Crago were eating lunch and, despite the roughness outside, they had no difficulty drinking their coffee and soup. The size of the Clipper ship seemed to make it ride the rough air better than any other plane we had ever flown in.

We made three broadcasts during the morning and listeners heard how the Philippine Clipper was flying serenely out over the Pacific through a squall.

About 3 o'clock in the afternoon, we flew out of the squally weather into a hazy, overcast sky. The sun was shining, but its rays were foggy and blurred. Despite the rough weather we were more than halfway to our goal. The sun, high in the sky, cast the shadow of clouds on the water and we were fooled several times into thinking land was not far off.

Later, what a thrill we experienced when Captain Tilton, after a moment or two of steady gazing, leaned over to Captain Dahlstrom and pointed to what we thought was another cloud shadow!

"There's Midway," he shouted.

It's a long way off and so flat that we privately believe it is just another cloud shadow that will disappear when we approach. Nearer and nearer we fly and now there is no doubt—land is ahead!

We drop lower and a foamy reef is beneath us. Inside, in contrast to the darkness of the ocean, we see clear water, suggestive of an artificial swimming pool. Gleaming white sand is visible down through the clear, blue-green water for some distance from shore (page 690).

We are over the land now and, even so, how small a spot it is in all this great expanse of ocean! The main island (Sand Island) is a mere five miles in circumference.

BIRDS, AND A CABLE STATION

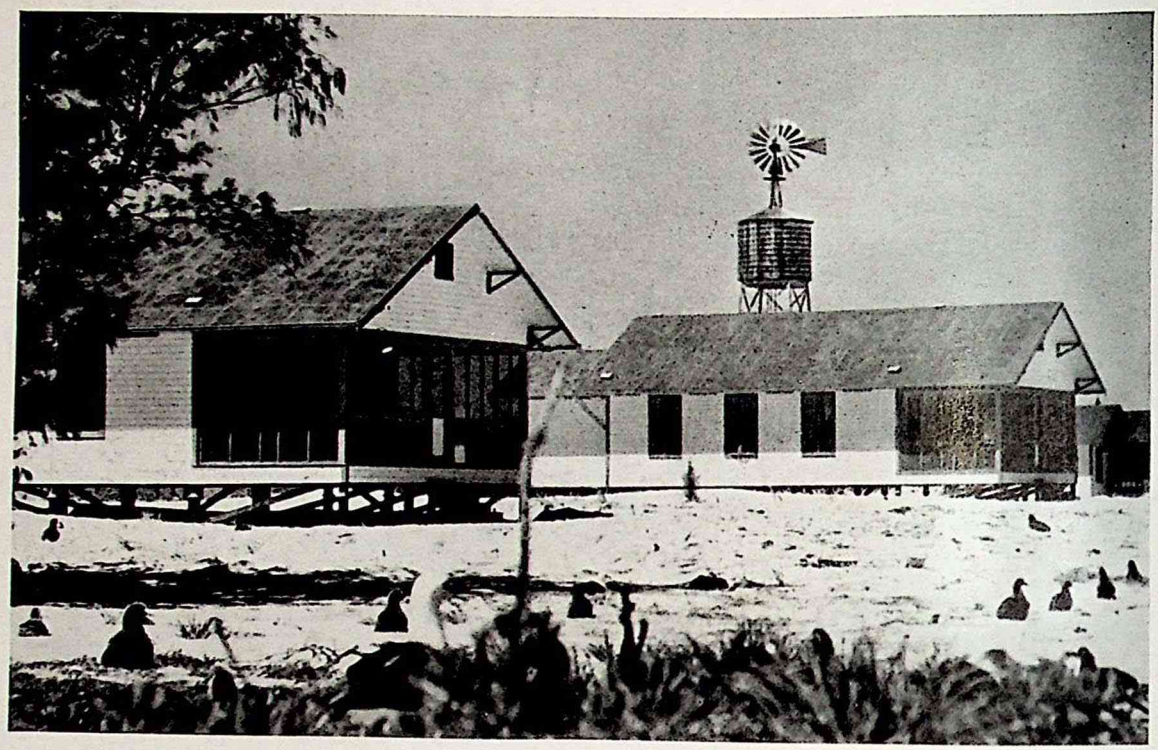
On the lagoon side, we make out twelve or fifteen yellow buildings topped by red roofs, radio antennae, two water towers, and a pier running out into the water. There is little sign of foliage. We swing down to the far end of the island and it seems alive with birds. Midway is a Government sanctuary for them, we are told (pages 667, 686, 692, and 693).

Turning back, we fly over an area thickly grown with trees on the other side of the island. There is located the Commercial Cable Company station, we learn, its representatives having occupied Midway for more than thirty years.

Captain Tilton signals that we are to land. Everyone takes a seat. Swiftly we come—gently we hover—splash, skip, splash—swoosh! Our second leg outbound is completed. The Philippine Clipper is at home on the waters of the sparkling blue and white lagoon at the Midway Islands, Pacific Ocean, 3,708 miles by Pan American route from the mainland of the U. S. A.

We taxi in and, as at Honolulu, a boat puts out to attach mooring lines. We are drawn in, our nose snubbed to the barge. Tanned, husky youths come aboard through the forward hatch and greet the crew. They are eager to get mail and news from home.

You look in wonder at these chaps who willingly maroon themselves out here for six months at a time. It is splendid ad-



A TOWN SPRINGS UP IN "GOONEYLAND"

Neat yellow houses sprouted overnight on the sands at Midway, previously occupied only by sea birds and a lonely cable station. Prefabricated buildings and furnishings—complete to the last ash tray and cake of soap—were unloaded from the capacious hold of the SS. *North Haven* and set up on Sand Island to form the mid-Pacific base of Pan American Airways. With a windmill and a solar heating system, sun and wind are harnessed to give hot running water.

venture—this building and maintaining a civilization on a small island in mid-ocean—but you question whether the isolation isn't boring and lonely. They all appear fit and rugged and when later you learn of their routine you come to understand there is little time for loneliness and none for idling.

CREW DOUBLES ISLAND POPULATION

The coming of the Philippine Clipper, with its personnel of 14, doubled the colony's population. The cable station on the far side of the island had a total of 23, but Pan American's Midway base was operated by 14 men.

Our broadcasting done for the day, we went ashore. Despite the wind, it was warm, and two of the officers, doffing their clothes and diving from the wing of the Clipper, splashed in the clear water. Fish swam all about and for twenty or thirty feet out from shore, the bottom was clearly visible.

The roar of the surf on the reef came faintly to us and we could not help visualizing that in no time at all this splendid beach would be a popular vacation spot.

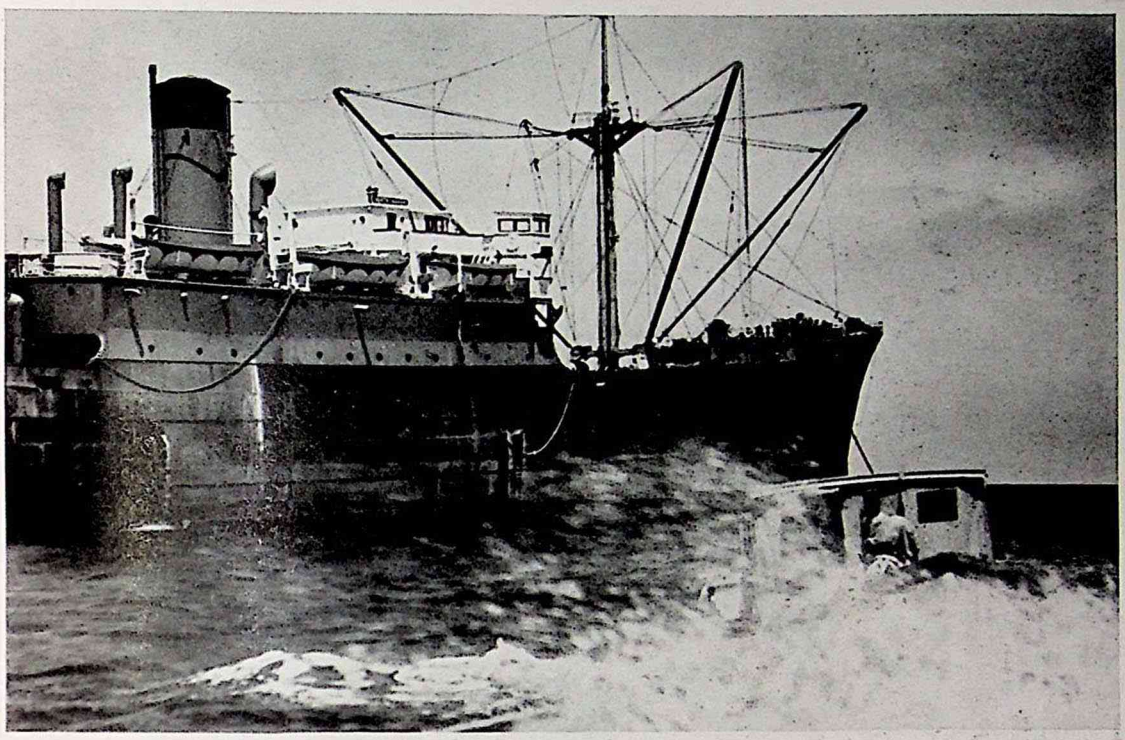
On shore we found the sand was deep and heavy. A boardwalk was to be the main street, but on our visit it was not yet constructed. A tractor drawing a sledge ploughed from the end of the pier to the group of buildings inland.

Entering the one to which we were assigned, we found small rooms equipped with all-metal furnishings finished in walnut. Down the central hall was a shower room and lavatory. All the comforts of home are at the disposal of these chaps housed at Midway.

BETTING ON THE "GOONIES'" MIGRATION

It was an hour or more before dinner and several of the boys offered to take us across the island to the Commercial Cable Company's compound.

As we walked through the sand, birds were everywhere, particularly "gooney birds"—the Laysan albatross. They are black and white, with a glossy coat and a wing spread of several feet (667). They



TOSSING IN THE SWELLS FOUR MILES OFF MIDWAY, THE "NORTH HAVEN" UNLOADS A VILLAGE

A saga of modern pioneering is the story of this steamer's voyage in 1935 to transform tiny, desolate islands into up-to-date communities and way stations for transpacific air travel. Coral reefs made it necessary to anchor offshore and transfer cargo in a heavy swell, with constant danger that a ten-ton tractor or piece of machinery would crash through the deck of the lighter.

are web-footed and waddle, duck-fashion, when they walk. They have long beaks which they clack and, around their eyes, the marking suggests the use of make-up.

Each year they fly in from the sea, mate here, and hatch their eggs. When the young are grown they leave, not returning until the next year at the same time. The men at the Commercial Cable Company station have betting pools to determine the date the goonies will appear.

Wherever the goonies decide to nest in the sand they do so, even though it may be the path of the tractor or a walk leading to the houses. Should the tractor come along, they refuse to move. They apparently have no fear of man. Time and again as we walked toward the compound, our companions would stop and with a stick stroke the heads of some that clacked their bills as we passed.

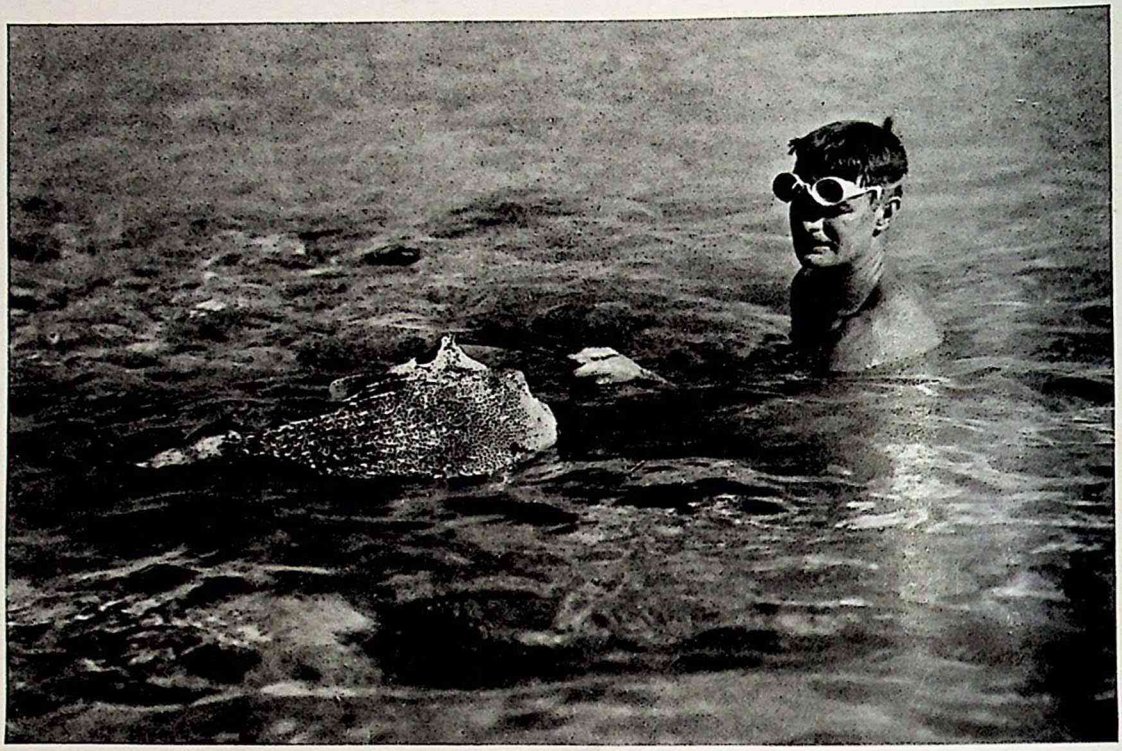
At times, as we passed a group, their clacking would become an insistent chorus, and we could not determine whether this was a greeting or a jeer.

We also saw some all-black goonies and noticed that the Pan American boys did not attempt to pet them. Upon inquiry, we learned that the "black legs," as they called them, were the scavengers of the flock and usually appeared on the island first. These were the black-footed albatross, a distinct species. The men warned us that the birds would peck viciously if we went too near.

This was in contrast to the black and white ones, which occasionally would follow us, clacking in an old-womanish fashion and rubbing their heads against the legs of the Pan Americans.

We noticed many holes in the sand as we walked and several times all but stepped into them. Responsible for these is another sea bird, a shearwater, called the moaning bird by the island staff.

By day these birds and some of their petrel relatives dig themselves into the sand. By night they wheel through the air, apparently blind, flying into anyone who is abroad or smashing out their lives against the build-



AT WAKE ONE MAY FISH AND SWIM AT THE SAME TIME

One amphibious member of the Pan American base staff introduced a technique of diving under the water and shooting fish with a steel arrow propelled by rubber bands. This is a porcupine fish, studded with sharp spines. The aquatic hunter, wearing underwater goggles, is Hope Biggers (page 693).

ings and poles. The call of the wedge-tailed shearwater, most common among them, is given throughout the night; the sound is a moan like the cry of a fretful baby.

We passed through a grove of trees and the birds were thick. There were rails, canaries, boobies, frigate, and bosun birds, but the goonies and moaning birds were most numerous.

Arriving at the Commercial Cable Company's compound, we found sidewalks, concrete buildings, a vegetable garden, and tennis courts. On the advice of the United States Department of Agriculture, the cable company had imported soil, bringing in a quantity on each visit of the supply ship until they now had 2,500 tons of earth on the island.

They had also imported ironwood trees that grow in a small amount of soil and a bunch grass that was planted in clumps and spread, helping to keep the fine sifting coral dust and sand from blowing into everything when the wind was high.

From Laysan Island, 400 or more miles eastward, was brought here years ago the curious Laysan finch, like a yellow-breasted sparrow, but belonging to a family of birds peculiar to the Hawaiian Islands. With these there were introduced also the Laysan rails. The rails are almost tailless and cannot fly. In some respects they suggest young chickens as they run swiftly around under foot, pecking at the ground.

Domesticated canaries also were introduced and have established a thriving colony in the wild.

It was growing dark when we started back across the island. In the dusk, we could understand and sympathize with the Pan American staff's distaste for the moaning birds. They do swirl into your face and the holes they dig are not easy on ankles when you stumble into one of them in the dark.

THE MATING DANCE OF THE GOONIES

As we walked back through the small grove of ironwood trees, only our flashlight beams saved us from stepping on the little birds resting in the path. On the other hand, the clack of the goonies' bills would usually warn us off if we came too near.

Reaching the other side of the woods, we



NOT THE EGGS OF SOME STRANGE BIRD, BUT GLASS NET FLOATS WHICH DRIFTED HALFWAY ACROSS THE PACIFIC FROM JAPAN

Hundreds of the shiny hollow balls lost by Japanese fishermen have been washed ashore at the Midway Islands where they are prized as souvenirs by the Pan American base crew. The glass spheres ride intact through heavy surf pounding on a coral reef. Caught in the currents of the wide Pacific, they wander thousands of miles, many even reaching the coast of the United States.

came upon several gatherings of goonies and a sight that was both beautiful and humorous—their mating dance. Two goonies stand face to face, wings partially spread. A huge circle of their fellows around them carry on an incessant chant and clacking.

As graceful in dance as they are clumsy in walk, the two partners rear their heads toward the sky, their necks arching swan-like, then duck to the ground and, raising, touch beak to beak (page 693).

Another movement of the head then begins, the pair ducking their beaks first under the left wing, then the right, rearing their heads again to the sky—two dancers matching step for step. This goes on for several minutes, the clacking of the circle reaching a crescendo as the dancing pair increase their rhythm and motion.

In one or two of these circles it was noticeable that one of the dancers would stop as the dance progressed and always—the eternal triangle—there was another fellow waiting on the sidelines to take up the dance and steal the partner.

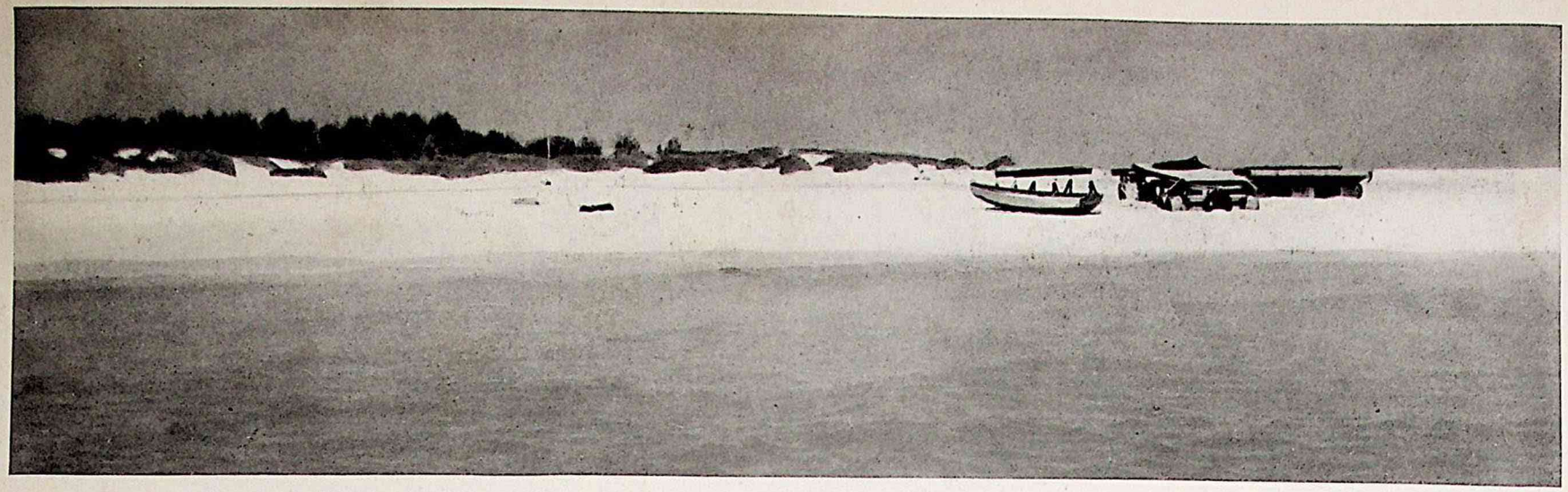
At the recreation house, most of the staff were sitting or standing around the radio, listening to a news period from a station in faraway Hollywood. The lights, the clean rugged faces, the easy conversation and furnishings suggested a club room most anywhere at home rather than on this out-of-the-way coral dot in mid-Pacific.

The meal was excellent and though no supply vessel had visited Midway for more than six weeks, we had everything we might have requested at home. In the modern refrigeration plant perishable foodstuffs can be kept fresh for months at a time.

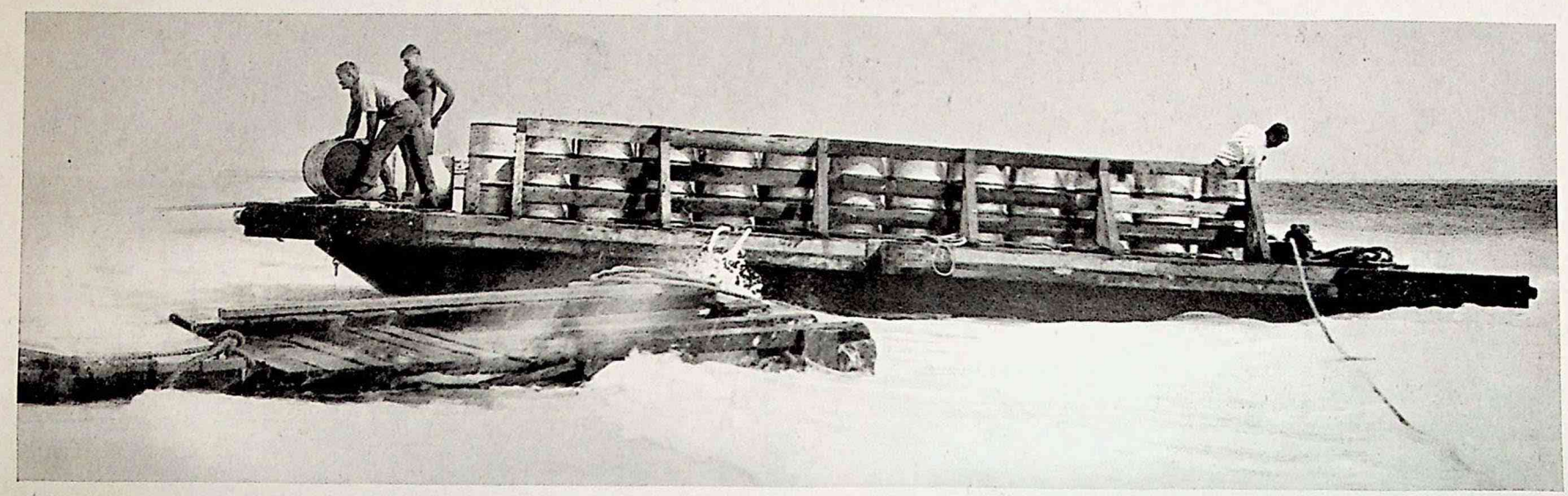
After breakfast next morning, our luggage was put aboard the sledge. The tractor's motor made a noisy racket, but it is the pride of the Midway staff; without it, little could have been accomplished (691).

We got aboard and though it was not cold, the chill air and the whiteness of the sand suggested a northern climate rather than an island five degrees above the Tropic of Cancer.

All were on board after several boat loads, and the engines of the Clipper took

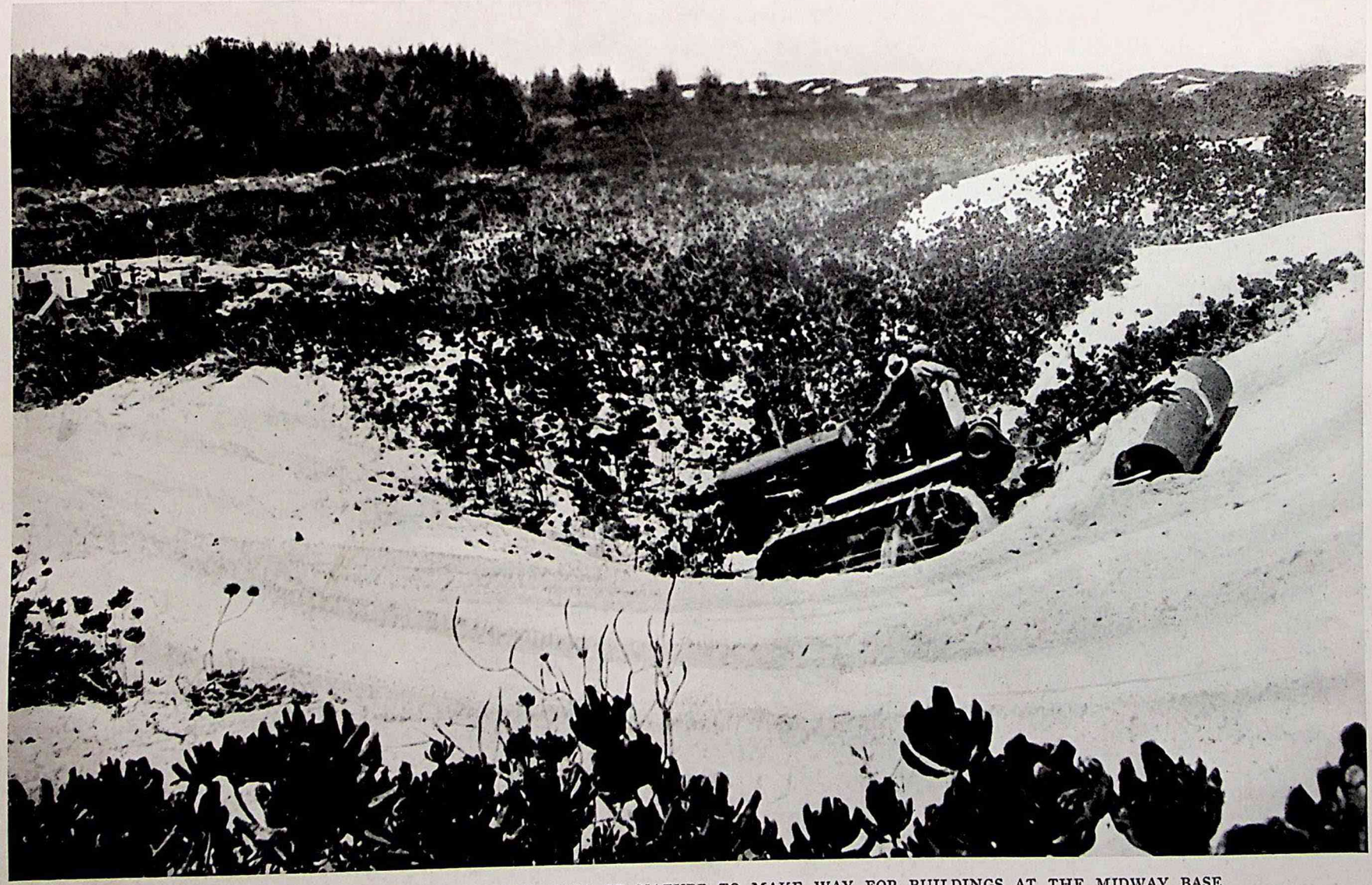


WITH GLEAMING WHITE CORAL SANDS AND BLUE-GREEN LAGOON, MIDWAY INVITES AIR-BORNE VACATIONISTS



UNLOADING FUEL FOR THE CLIPPER SHIPS AT A MID-PACIFIC GASOLINE STATION, THE MIDWAY ISLANDS

Though they lie in the midst of the Pacific, the islets comprising this coral atoll, with their excellent fishing and swimming, are only two days by air from San Francisco, now that the Clippers are maintaining a weekly schedule to and from the Orient.



SMOOTHING OUT THE WRINKLES IN THE FACE OF NATURE TO MAKE WAY FOR BUILDINGS AT THE MIDWAY BASE

Down one side and up the other a rough-riding "cat-skinner" drives his "cat" (as the crew called their caterpillar-type tractor). Leveling building sites, hauling heavy loads, serving as an all-around beast of burden, this big iron horse helped establish the Pan American base on aptly-named Sand Island.



THE GENTLE LOVE TERN MAY ALIGHT ON YOUR OUTSTRETCHED HAND

These graceful birds have a quiet curiosity which is particularly appealing in contrast to the screaming of the sooty terns, the noisy beak-clacking of the goonies, and the moaning of the wedge-tailed shearwaters. Snowy white, with jet-black bill and eyes, the love tern borrows beauty from the water when it flies over a coral lagoon; the under-wings seem a delicate blue or green, a reflection of the water's tint (page 693).

up their tune again. We taxied for fifteen minutes, waiting for the light to appear, then as brilliant colors splashed the gray background of the sky, the Philippine Clipper roared off the choppy water on the way to Wake Island, 1,182 miles away.

On this, the third leg of our flight, the weather was ideal. This portion of the course is out of the way of the regular ship lanes and there are no islands to be seen.

TALKING "OUT OF TODAY INTO YESTERDAY"

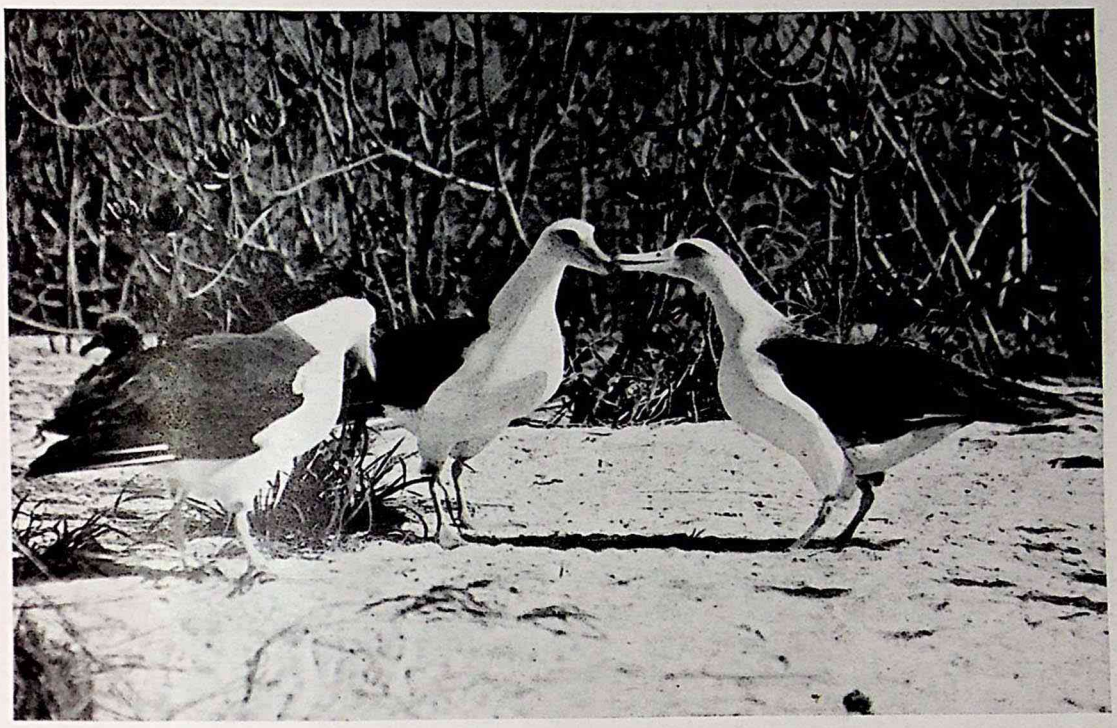
Less than two hours out of Midway, we ran into difficulties on our broadcasting schedules. We had left Midway at dawn Thursday and when we were an hour and a quarter in flight, Ingram informed us we had crossed the International Date Line and it was now Friday. At one moment, it was 6:52 a.m., Thursday, and the next it was 6:53 a.m., Friday. From this point on, whenever we broadcast, we were talking out of today into yesterday.

Several times we explained the situation, but it must have confused casual listeners to hear someone talking about Friday, December 13, when to them it was still December 12. Messages transmitted between us and NBC often proved confusing. Imagine, for example, receiving a radiogram Friday morning telling us to originate a program for Thursday afternoon!

This flight between Midway and Wake is the shortest hop crossing the Pacific. The sun was still high eight hours after our take-off when, from 8,000 feet, we saw the white foam of a semi-circular reef and Captain Tilton told us Wake was ahead.

Before the coming of the SS. *North Haven* in May, 1935, Wake had been an uninhabited coral atoll described as barren and overrun by Polynesian rats, birds, and hermit crabs. Accordingly, we expected a night at Wake would be most uncomfortable (page 687).

With such thoughts in mind, we were totally unprepared for the model community that had blossomed there in seven short months. As the Philippine Clipper crossed the reef and flew over the lagoon,



"PARDON ME, BUT MAY I CUT IN?"

Even among the goonies of Midway Islands the eternal triangle appears! While two touch beaks in solemn bliss in the mincing measures of the mating dance, another fellow awaits his chance to steal the partner (page 689).

we could see an American flag floating lazily from a pole in the center of the buildings. White lines, apparently paths, could be seen amidst the foliage (page 695).

The water in the lagoon was as clear as that at Midway and moored offshore were a sailboat and sea sled.

A long ramp led from the shore out over the water to a landing barge. At the end of the walk on a pole was a wind sock, gently swaying in an indifferent breeze.

From the sky Wake suggested a finished community—not a frontier town in the making. Was our mid-Pacific resort already an accomplished fact? Lower and slower we flew over the lagoon and now the little Hawaiian dynamiter was peering out the lounge windows intently.

The Philippine Clipper turned, then slowly descended, slipping into the lagoon waters. We clambered out the afterhatch and, looking down into the clear blue-green water, could see the coral heads which were soon to be removed, mottled green and ugly. But our landing point had been carefully selected and not one of them was directly in our path as we taxied in.

The air was that of the tropics—warm and pleasant. The sun was hot. White terns flew over the water and we could not help but call out at the beauty of their under-wings, a delicate blue and green.

But the crew laughed at us. Terns, they said, are pure white or sooty. The blue under-wings and breasts we saw were a reflection of the waters of the lagoon (page 692).

A FINISHED COMMUNITY OF SEVEN MONTHS

We were nearing the barge now and a large man was standing talking to a smaller man dressed in uniform blue. He waved across the water to Captain Tilton and his big ruddy face creased into a smile. He was George W. Bicknell, in charge of Wake Island for Pan American Airways. He had come to the island with the SS. *North Haven* and was to return to the United States with us. The smaller chap was Hope Biggers, who had arrived at Wake on the China Clipper to relieve him.

As we left the ship, greetings and introductions were made. Halfway down the

ramp, a Chinese boy held a tray of cigarettes. Smoking is not allowed on the Clipper ships and this thoughtful preparation by George Bicknell is typical of our stay.

Heavy sand is no problem here and everywhere we turned Wake seemed an established settlement.

Wake Island rails, larger than those of Midway, ran about here and there, but not underfoot. Here at Wake, they give a definite impression of barnyard fowl.

RAT SHOOTING AN EVENING PASTIME

Now and then we saw furry, short-tailed rats, but with the coming of Pan Americans their numbers had been greatly reduced. Each night, we learned, there were forays on them. Air rifles were popular and, after dinner, members of the colony shot them by the score.

The Chinese houseboys, lacking rifles, had become expert in stoning the rats, felling them on the run. This ceaseless warfare, plus chemicals and poisons brought in at the suggestion of Government departments, is cutting short the reign of Polynesian rats on Wake Island.

Our host suggested a swim before dinner and off we went to the beach (page 704). Underwater goggles were produced and for more than an hour the Clipper's personnel swam about, peering down into the clear water and studying the beautiful coral formations. Small fish were all about, apparently fearless of man (page 688).

As we returned, the flag was being lowered. Instinctively we paused. No bugle was sounded and there was no ceremony. But the picture of the setting sun, Old Glory, and the Philippine Clipper at rest on the water, caused a hot surge of pride as we realized that here, under the protection of that flag, an island, worthless to mankind until a short time ago, had been made over into an aviation way station to serve ships of the air and offer a comfortable resting place in mid-ocean for travelers on their way to the Orient and beyond (pages 695-7).

After showers we were called to the recreation hall for dinner by means of a whistle. Imagine our astonishment at finding place cards, showing a sunset scene at Wake which George Bicknell had photographed. We could not help but look in wonderment at a man whose leadership had helped wrest this community from desolation, yet who found time to photograph sunsets and make place cards for a dinner.

After dinner, we joined for a time in a rat shooting expedition. Honors for the largest number bagged were divided that night between Runnels and Harmantas. Between them they accounted for sixty.

Later Bicknell led us to a spot behind the laundry house. In the moonlight we could see chickens at roost on high perches and off to one side we heard a curious scratching, scraping sound.

Some lengths of corrugated metal roofing were moved and we saw hundreds of hermit crabs of all sizes continually crawling over one another in the damp earth. These crabs change their shells as they grow, usually taking over one vacated by an older crab. They are scavengers and are sometimes pests.

On Wake Island, Nature is truly in the raw, Bicknell explained, there being a never-ending battle between the flightless rails, the rats, and the hermit crabs. Constantly they prey upon one another. It was a pleasant relief when we returned to the recreation house.

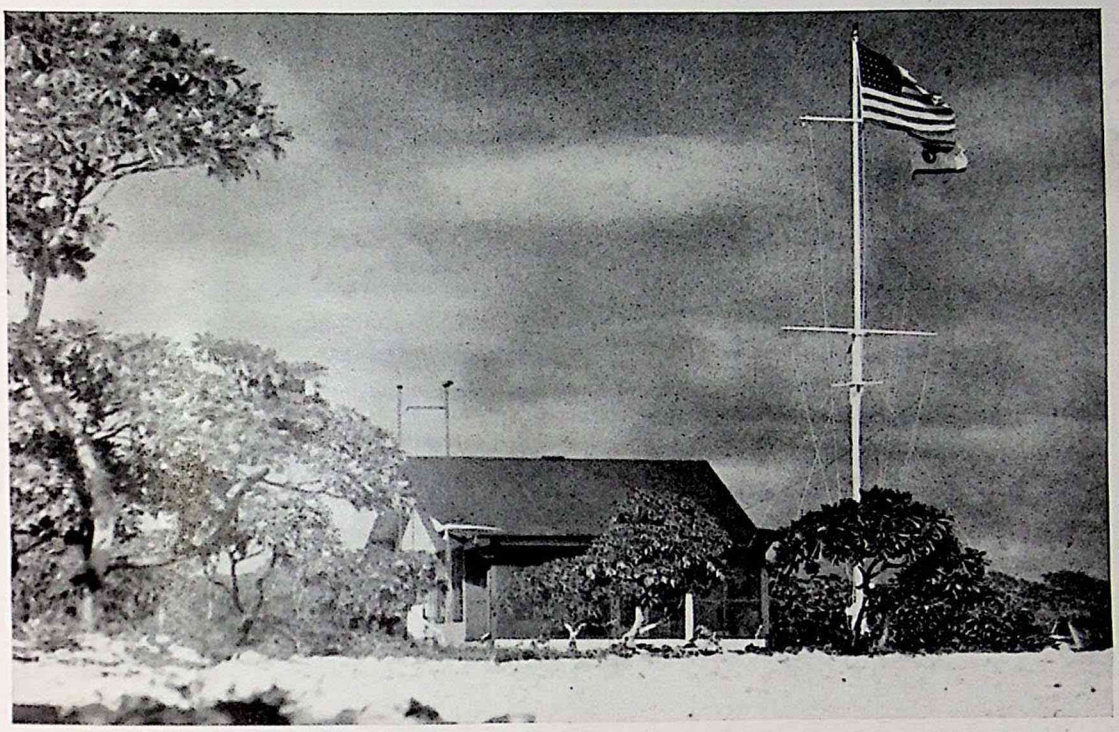
We turned in early and slept later than usual since we were to spend the day on Wake. After breakfast, the two Captains went fishing with Biggers, the rest of us electing to tour the islands with Bicknell.

"DON'T STEP ON THE BIRDS"

Near the southern end of Peale Island, one of three composing the Wake Island group and site of the Pan American base, we came into a swarm of birds nesting in a grove of the trees called beach magnolias and sitting in the warm sand.

They were sooty terns and one had to walk with care to avoid stepping on them. They made no effort to move out of the way, nor would they squirm much if one sought to stroke them or pick them up. There were thousands of them all around, either in the air or resting on the ground. Some, more inquisitive than others, would flutter up in the air almost level with our eyes and study us as we walked. Several times these terns fluttered down and all but alighted on the extended barrel of a gun.

High in the air, wheeling to and fro, were the frigate and bosun birds. The frigates were beautiful in flight, their wings appearing to be notched. The bosuns give a curious impression of apparently flying backward. Heading into the wind, they



OLD GLORY FLIES ABOVE A PATCH OF UNITED STATES TERRITORY SEVERAL THOUSAND MILES OUT IN THE PACIFIC

Once thought worthless, Wake Island, 4,890 miles by air Clipper route from San Francisco, has become valuable as a way station on the Pan American Airways' route to the Orient. The flagpole stands beside the administration building on Peale Island, one of three coral islets comprising Wake. Until the coming of the SS. *North Haven* less than two years ago, these islands were inhabited only by hordes of rats, birds, and hermit crabs (page 692).

cut down their flying speed until they are actually borne in the opposite direction.

BOOBIES WILLING TO POSE

We came upon two red-footed boobies perched on a low limb. They are comical in appearance, having over-sized beaks and red webbed feet. Harold See, opening his motion picture camera, walked toward them. As if sensing what he was doing, the two began turning from side to side, preening and posing.

When he advanced right up to the tree, one of them leisurely spread its wings, posed for a second, and flew toward the camera and over Harold's head, as if it wished to provide a proper fade-out. The other, apparently miffed that its mate had stolen the spotlight, turned its back on the camera and finally fluttered off a short distance.

Continuing around the island, we saw rocks and shells of many hues. Once or twice we came upon tiny hermit crabs in shells as small and as pink as a baby's fingernail. It was hard to connect these delicate shells with the monstrosities we had seen earlier.

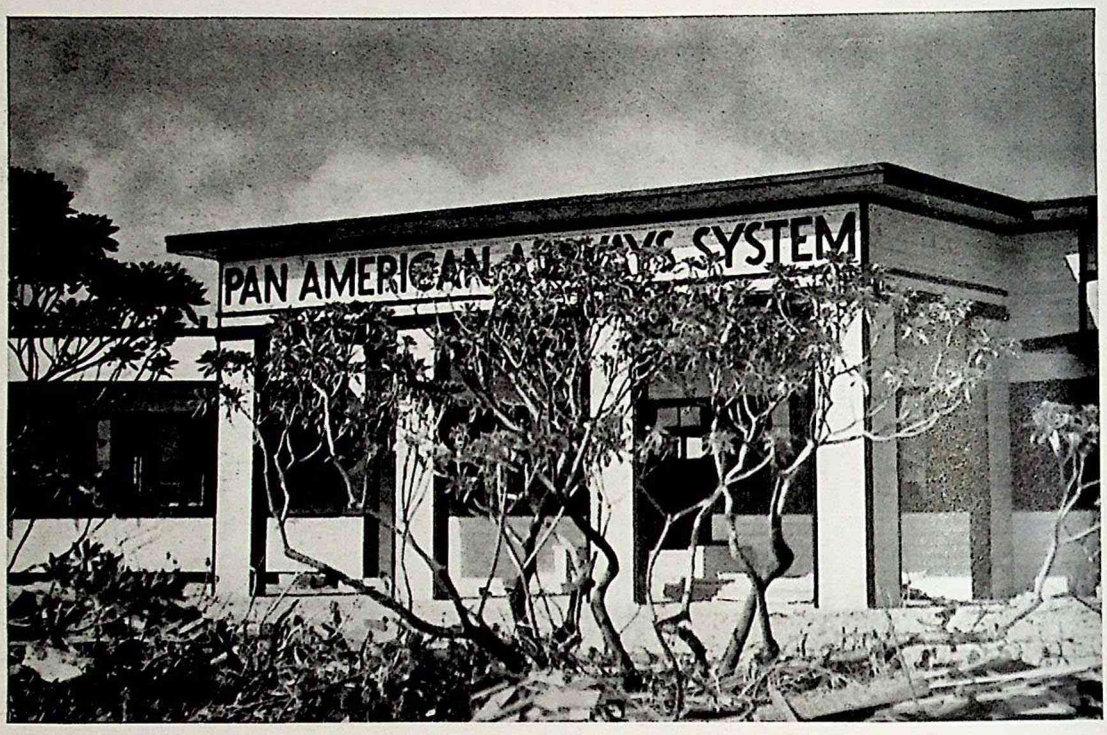
We had been clambering over some gray rock for a short time when Bicknell stopped. "Want to climb Wake's highest mountain?" he inquired. Hot, but anxious to see everything, we assented. He turned inland, See and I following.

Our guide had taken no more than ten steps when he stopped. "Here we are," said he. "This is the highest point on the Wake Island group—twenty-one feet above sea level."

We pressed on and, rounding a turn, saw the Philippine Clipper resting in the calm waters. We had circled the island.

Our day was done and we were weary, yet eager somehow to move on. Dinner was a repetition of the night before, though the menu was varied. Soon all were in bed and before we quite realized it someone was shaking us.

"Four-thirty," said a voice. It was pitch dark but we knew that the sun was not far away. Breakfast was leisurely.



A 45-ROOM HOTEL APPEARS ON A HITHERTO UNINHABITED ISLE

This low, rambling inn on Peale Island in the Wake group is one of three complete hotels shipped from San Francisco on the SS. *North Haven* and set up at Midway, Wake, and Guam. All three places are overnight stops for the Clipper ships, both eastbound and westbound. Transpacific travelers spend only one night in the comfortable berths of the Clippers—on the 2,400-mile hop between Honolulu and San Francisco. Rooms in this hostelry have all conveniences (page 676).

During the night the Philippine Clipper had been moored offshore and it was a few minutes before the launch brought us alongside. After a little time the sun was visible and we were under way—sailing off the water and out over the reef within a minute after our run was begun.

It was Sunday morning on our side of the world—and Guam lay some 1,500 miles ahead.

SEEING THE CLIPPER IN COMPANY DRESS

For the first time on the flight we had an opportunity to see the Philippine Clipper in company dress, as those who follow us will always see it. The balance of our freight had been left at Wake.

We had been nine hours in flight when, far ahead, we saw Guam. Unlike Midway and Wake, it stands high out of the water, some 1,300 feet on the southern end which is the approach from Wake. It is surprising how far off it is visible, for after we saw it from 9,000 feet, it was thirty-five minutes before we were near enough to look down and study the terrain.

Here and there we could make out groups of buildings among the trees and fields, but it was not until we had flown for ten miles up the western coast that we saw any sort of settlement. We were over the Marine Barracks near Sumay where we were to land for the night.

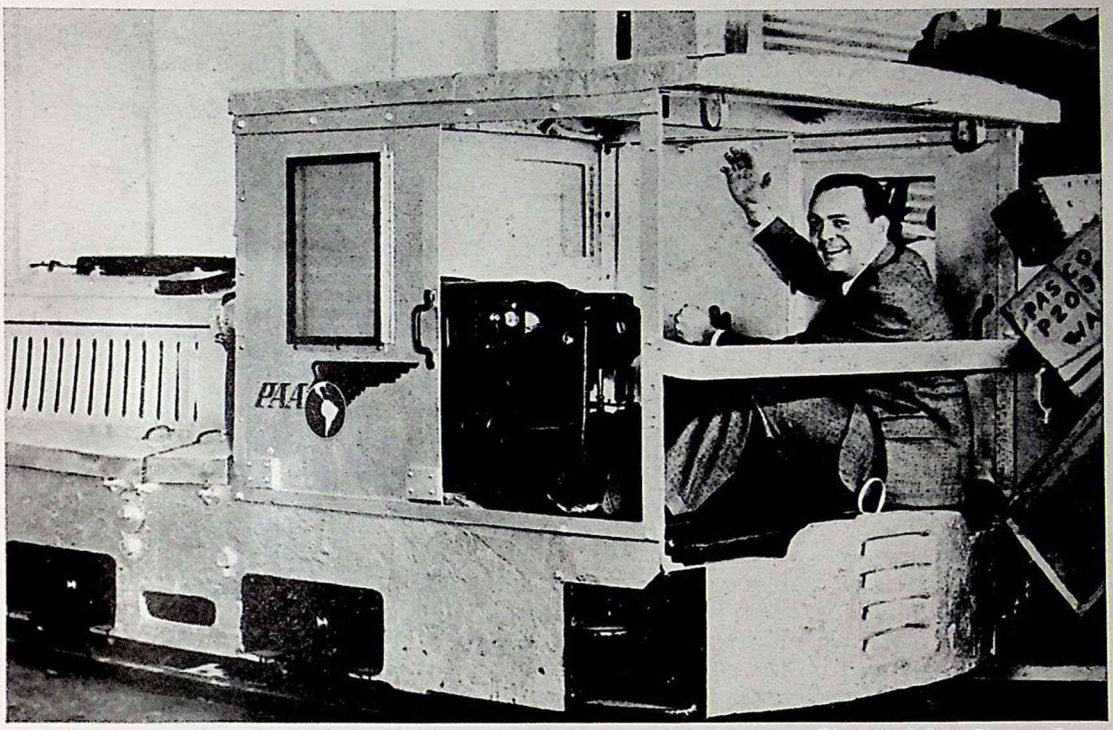
Before coming in, however, Captain Tilton continued flying north, following the coast line and turning slightly east until we were over the principal city, Agaña.

Having heard Guam described as small and isolated and having landed on two small dots in the Pacific, we were not prepared for an island so large. Guam is 30 miles long and four to eight and a half miles wide. Its total area is a little more than two hundred square miles. Agaña is a city of six thousand persons.

ASHORE AT "SPACIOUS" GUAM

At Sumay a crowd lined the sides of a mooring slip and waved as we flew lower. The water was choppy and we braced ourselves for a bumpy landing, but none came.

The Philippine Clipper entered the water



Photograph from Pictures, Inc.

WAKE MAY BE LITTLE, BUT IT HAS A RAILROAD

When a base was first established on this coral atoll, track was laid immediately for hauling supplies across Wilkes Island on the way to Peale Island, the most desirable site. A small but effective engine was provided and the transport has become a white-collar job.

as cleanly as an expert diver. It had taken us 9 hours and 52 minutes to fly from Wake.

Brown natives smiled and waved at us from the walls of the slip. Navy and Marine officers in dress whites were standing about. This was the third time a huge flying boat had come over the seas to Guam, but already such an apparition seemed as calmly accepted as the arrivals and departures at a metropolitan airport.

Until the coming of the Clipper ships, mail from the United States took weeks to reach Guam. Much of it came by way of Manila, 1,730 miles beyond by boat. We were told the average time for fast ships between the United States and Manila was three weeks, after which the mail had to be brought back from Manila on one of the three transports due to visit Guam that particular month. Now Guam and San Francisco are only five or six days apart.

Visiting Agaña, we found a main street with bank buildings, two motion picture theaters, automobile supply stores, a garage or two, and all the other shops and services necessary to a small modern community. Agaña was ten or twelve miles from Sumay, and motoring over the narrow roads we could not make much time.

Captain Tilton had advised we would have to stand by for another early take-off, so no one tarried long in Agaña.

Before dawn next day, the Philippine Clipper was lifting off the water for our last port of call, Manila. In our part of the world it was Monday. In the United States it was Sunday. As we climbed, the sun was still below the horizon, but its rays could be seen lightening the gray clouds from above.

THE HOP TO THE 7,000 ISLANDS

Although a longer hop than the one between Wake and Guam, this flight toward Manila did not seem to drag. Just after noon See called us back to the tail. He was listening to a station in Manila. KZRM there was advising that the Minister of Communications and other officials desired to greet Captain Tilton.

Here we were aboard the Philippine Clipper, 350 miles from Manila, and voices from the studios of KZRM were almost as

audible in our earphones as though we had direct telephone communication. KZRM reported the signal from our transmitter, WOEH, was strong and clear.

Two hours later we sighted land south of west of our course. We thought we were in sight of our goal, but the Philippine Clipper continued on its course.

A short time later more land loomed up ahead, but still we held our altitude and speed. Referring to our notes, we began to appreciate the statement that the Philippine Islands are made up of more than 7,000 individual islands.

Our goal was the island of Luzon and Manila Bay. On we flew and after another hour we began to drop down through puffy white clouds. We were over a large expanse of land, Luzon.

Lower we settled and soon buildings, massive white buildings, set in parked lands and along drives, were visible. Hundreds of cars could be seen on the streets below. We were flying over Manila (page 705). Descending still lower, we could see thousands of people lining the bay and boats were everywhere.

THE PHILIPPINES GREET NAMESAKE PLANE

Word came to us over KZRM. Would we remain aloft a short time and give the populace an opportunity to see the Clipper named for these islands?

We checked Captain Tilton. Obligingly, he turned in a wide circle, settling lower and lower toward the housetops. Everywhere below was excitement. Automobiles stopped on the streets as their occupants stood and waved. The crowd along the bay front was a field of waving arms, white handkerchiefs, and umbrellas.

Out over the bay we turned again and began the gradual glide toward the water. Flattening out just above the surface, we hovered for a moment and then water splashed along the windows. The Philippine Clipper had landed on Manila Bay.

We had flown from Guam in eleven hours and ten minutes. Our total flying time from Alameda was 58 hours and 37 minutes.

We taxied in toward shore and boats closed in around us from everywhere. Smart motor launches alongside native sampans; snarling outboard motors bumping into paddled dugouts; tugs growling their way through the mass of small boats; police boats blasting a path through all of them.

On shore the crowd appeared to be tremendous. Eager smiling faces were everywhere, waving and shouting greetings.

Landing, we made our way through a cheering, jostling crowd and, with police attempting to clear a path, entered automobiles and were driven to the Manila Hotel. In Manila, automobiles drive to the left—English fashion.

Our schedule called for only two days in Manila, so we were glad that formal receptions had been dispensed with to let us see something of the island.

Harmantas, the meteorologist, visited the Jesuit priests in charge of the Observatory. This now is the central office of the Philippine Weather Bureau, although it was founded by the Jesuits in 1865. It is still run by them, supported by an arrangement with the Philippine Government.

The priests have gained much renown for their work in connection with the prediction of earthquakes and typhoons.

It was not a pleasing report that Harmantas gave Captain Tilton. Somewhere over the Pacific, in the vicinity of Guam, a typhoon was moving.

Lacking as yet the meteorological stations which Harmantas had been sent out to establish, there was no definite way to check the intensity or direction of the storm. Harmantas told us that, until he had more definite reports, he could not approve a take-off. We were not too depressed, however, for there is much to see in Manila.

Visiting the Clipper for tests of equipment, we would come upon people who were inspecting the ship. Always their comment was, "Think of it; they will be back in the States before Christmas!"

"The States" were twenty-one days by fast boat from Manila, but here they were aboard a craft that could return them within a week.

But we were not destined to return home for Christmas. Our stay in Manila lengthened to five days, and on our side of the world it was now December 22.

A COLD STORAGE CHRISTMAS TREE

Realizing we were to spend Christmas Day somewhere over the Pacific, the crew decided to decorate the Philippine Clipper. Guests in the hotel, hearing of the plan, took up the idea. We went shopping for a Christmas tree and found the only ones available had been shipped in cold storage



Photograph by P. Simpson

FRESH FISH FOR DINNER TONIGHT!

A fisherman with a "wind-up" like that of a baseball pitcher casts fine-meshed hand nets for small fry along the shore at Guam. Fish abound at Pan American's Pacific stations and members of the base staffs quickly became proficient at catching them (page 688).

from Oregon. Selecting one three feet high and finding ornaments and wreaths, we stored them aboard the Clipper.

That afternoon the rain ceased and Harmantas advised it was safe to take off; the typhoon had been located and was no longer directly in our path. In fact, we might make excellent time by taking advantage of the swirling winds on the outer edge of the typhoon that should be on our tail from Guam east.

We were ordered to bed at 6 p.m. and were called at 12:30 a.m. A Saturday night dance, inaugurating the Christmas season, was in progress in the ballroom of the hotel.

Breakfast was served to us in a side room and many deserted the dance floor to come in and wish good luck to the crew.

On the barge we waited, studying the black water, smooth and oily looking, until Harmantas came out from shore with the final weather report. For the three-day delay, the crew had dubbed Harmantas "Double Zero." Now, as we were bidding him goodbye, he was frankly lonely at being left behind.

The wind sock on the barge was lifeless when, just after 2 a.m., the engines were started. We cast off quickly and, for thirty minutes, Captain Tilton taxied over the water while Captain Dahlstrom and Second Officer Weber peered through the blackness.

Brilliant lights in the leading edge of the wing pierced the darkness and Weber, with a huge handflash, sought out objects in the bay, darting the beam this way and that as we moved slowly over the water. A mist hovered just above the surface and the rays did not seem to penetrate it sufficiently for the Clipper to make a run for take-off.

Overhead the sky was clear and starry. Outside the breakwater we encountered freshening breezes and passed several heavy destroyers and light cruisers of the Asiatic Fleet. Code messages were being sent from



Photograph by P. Simpson

IN GUAM IT'S WINGS OVER WATER BUFFALO CARTS WHEN THE CLIPPERS PASS

Beside the farmer's wife, with her sun-umbrella, is a lantern to be lighted when night overtakes their slow-moving vehicle.

their tall masts and these blinking lights seemed to discuss our preparations for take-off. Several of the destroyers pointed their tremendous searchlight beams along our course, helping to pierce the haze.

Here and there buoys blinked and once or twice we all but ran onto some markers not illuminated. Moving up the course, our own lights picked up a native sailboat, unlighted, tacking back and forth in the light breeze.

We had reached one end of our course now and, turning about, idled the engines for a moment. Then far down the dark lane of water a green Very shell momentarily lighted the scene. It was from the Pan American crash launch, telling Captain Tilton his course was clear and that he was to take off in the direction of the light.

A SAILBOAT CROSSES CLIPPER'S PATH

The four engines roared and we were up on the step. Faster we moved over the water, cruisers and destroyers whisking by as we gathered speed. Once our motors slackened and we swerved to one side. The unlighted native sailboat, still seeking a breeze, had unwittingly recrossed the path of the Clipper. Fortunately, the wing lights picked up the outline of its sail in time.

But now the engines resumed their pull. Faster and faster we skipped over the water, and at 2:43 a.m. Manila time, Sunday, December 23, we were in the air and on the way home.

As the lights of Manila dropped from us, we looked up into the sky. A quarter moon, lying on its back and giving the appearance of a huge saucer, rose to greet us, mockingly climbing higher as we sought altitude. At 10,000 feet we leveled off above the clouds and under the star-studded canopy of the night.

Harmantas had not been able to advise us exactly about wind direction and our flight was not a fast one. It was 13 hours and 57 minutes later when we came to rest on the waters of Port Apra at Guam.

We knew that the China Clipper was supposed to be en route from Alameda and the thought that these two air liners would pass in flight somewhere over the Pacific seemed to cheer everyone. It was estimated this meeting would take place between Wake and Midway, or that the two



Photograph by P. Simpson

"RAISING THE ROOF" IN GUAM

Chamorros, as the natives are called, thatch a house with the leaves of the ever-useful coconut palm, the tree that produces the island's most valuable export product—copra. The leaves, handed up from the ground, are laid in place by the men along the ridgepole.

Clippers might spend the night on the waters at Midway.

LOCATING AN ISLAND SPECK

Early the next morning we were off again, eager to arrive first. We were in the air at 6:29 a.m., but soon found we were flying directly into a 38-mile head wind. After eight and a half hours of flying, we still had 489 miles to go to reach Wake. This meant a night landing at Wake, the smallest base of all and therefore the most difficult to locate.

But the thought of finding this tiny island in the dark gave us no concern. Radio bearings would bring us in if we did not sight it at all, and actually, in the clear night air, if visibility was good, we should sight Wake more readily than by day when the sun casts deceptive cloud shadows on the water.

One thing did concern us, however, and that was the coral heads in the lagoon at Wake. But radio messages already were being exchanged with the base and George Bicknell was advising Captain Tilton of lighted marker buoys that would guide us safely onto the water.

On we flew, and as night came on, the stars made the heavens bright but cheerless. After several hours flying in the dark, the bridge informed all they had sighted Wake. We looked off to starboard and to the horizon. There was a light, but to us it was just another star.

SUPPER ANNOUNCED BY SIGNAL LIGHT

We flew on for fifteen minutes. Now we were closer to the "star" and the single gleam had separated into several lights—we were nearing Wake!

Soon we were over the reef, a white arch in the black water below. A row of lighted marker buoys indicated the channel. One brilliant light atop the flagpole began to blink. See and Runnels watched for a moment, then read aloud a message: "Welcome back to Wake—supper is ready."

We were low over the reef now. A green light flashed by the port wing and the next second—"swoosh"—a perfect landing on the coral studded lagoon, touching the

water exactly at the point the marker buoys indicated. Involuntarily, we all applauded. Dahlstrom had gauged the landing exactly and with the first contact the Philippine Clipper was in the water slowing down.

While terns swirled above, chirping shrilly, in harsh contrast to their beauty, flashlights revealed the white sand bottom and fish appeared to be momentarily paralyzed when caught in their beams.

Dinner was ready, as the blinking light had promised—and what a dinner! It was Bicknell's last night on the island and the Chinese kitchen staff had outdone themselves in his honor. There were turtle soup and turtle steak (from a big fellow that had eluded all the Wake Island fishermen for more than two weeks), corn, potatoes, hot rolls, and chocolate ice cream.

After dinner we were all disappointed to learn, through radio messages from Alameda, that the China Clipper had been forced to turn back after flying seven hours toward Honolulu. This was a genuine disappointment for the personnel at Wake and Midway, as the China Clipper was due to bring the Christmas turkeys, plum puddings, and other holiday fixings.

Within the hearts of the Philippine Clipper personnel, however, a new hope was stirring. Why could not we make better time home, carried on by these same winds that had turned back the sister ship?

We were eager to be off again and no one had to be called a second time the next morning when 4:30 arrived. After breakfast, everyone who could followed us down to the ramp. While the launch was being loaded they stood around, attempting to joke. All hands were rather quiet. They were losing the leader who had landed here with them seven months before.

As Bicknell had never seen the island from the air we circled slowly over Wake several times before heading out across the water for Midway.

HIGH WINDS SPEED FLIGHT

Climbing higher, we encountered high winds and, carried along by one 22 miles strong, flew to Midway in eight hours. We had gained a day on Christmas, and while it was the afternoon of Christmas Eve now at Wake, at Midway it was the afternoon of December 23.

Some of the flight crew, with families and sweethearts waiting on the West Coast to spend Christmas with them, were anxious to fly on with the favoring wind. But Captain Tilton ignored their veiled suggestions, although he too had a wife, and a baby just old enough to enjoy her first Christmas, waiting in San Francisco.

The strong winds continued throughout the night. At the base of the flagpole, and near some of the electric light poles, we found several dead birds, their lives dashed out as the strong wind drove them against these obstacles.

Next morning the air was clear and the sun bright. Strong winds drove us as our engines pulled us through the sky and we soon were aware that we would make record time in the 1,304-mile flight to Honolulu.

HOMEWARD BOUND, ON CHRISTMAS DAY

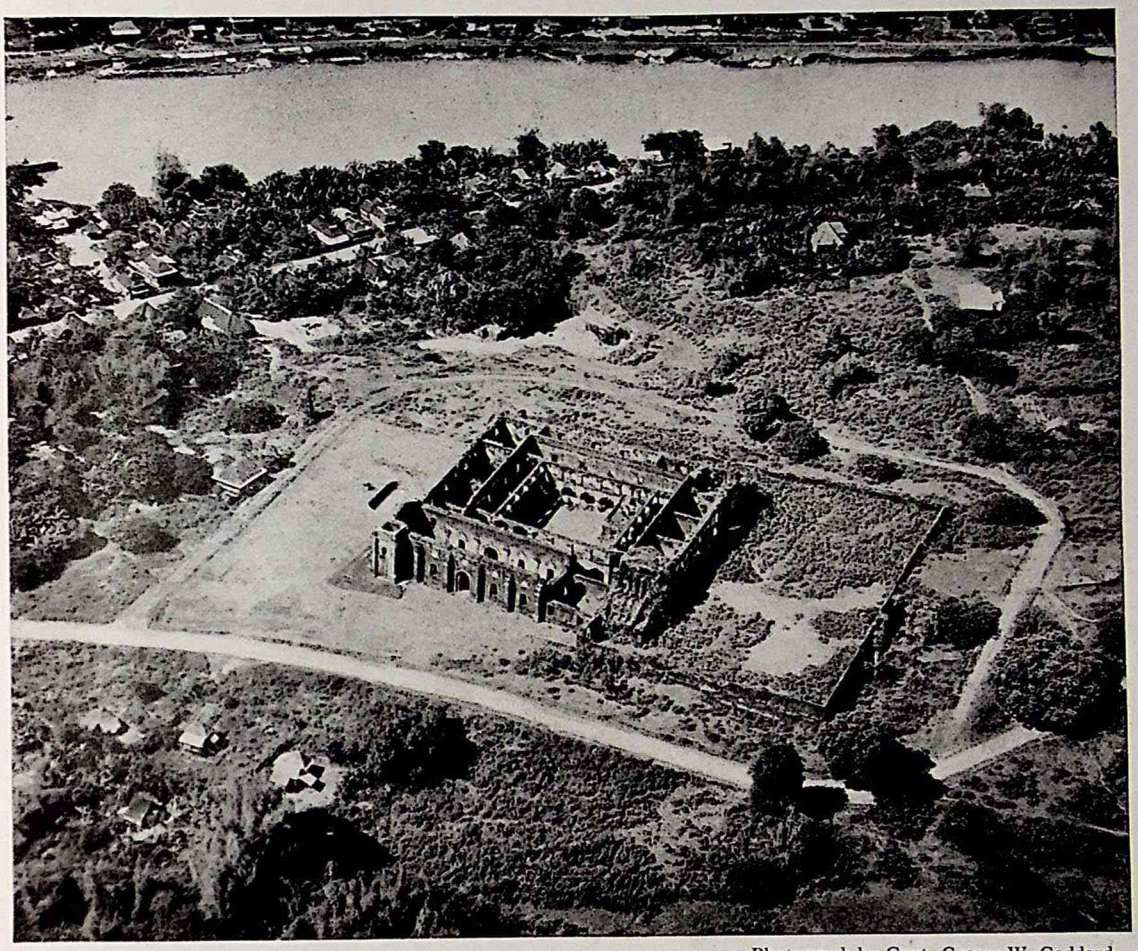
It was Christmas Eve, so we opened the packages we had obtained in Manila and decorated the three-foot Christmas tree which had been set up in the lounge. We hung holly wreaths at the windows, strung tinsel and red and green streamers across the ceilings, and hung small stockings on the light fixtures. Here and there were hung sprigs of holly—one of these sprouting on the instrument board on the bridge.

Seven hours and thirty-three minutes after leaving Midway, we settled on the waters of Pearl Harbor. As the Philippine Clipper was drawn inshore, Weber hung a huge holly wreath on the bowsprit and the small group on the shoreline cheered.

Here it was, after we landed, that the customs and immigration authorities put into practice their first experience at receiving air passengers at Honolulu. Bicknell and Karl Lueder, retiring manager at Midway, were passed as employees of Pan American Airways, but Harold See and I were carefully put through a routine—required to show our passports, etc. Obviously the customs officials were enjoying this first experience, for they were meticulous in each detail.

On Christmas morning the clouds were low, the weather rainy, so we thought there was little hope of getting off. Shortly after noon, however, the sun broke through and orders were telephoned for all to assemble at Pearl Harbor.

By the time we had reached the Philippine Clipper, the sun was brilliant and all evidence of the rain of the night and morning had disappeared.



Photograph by Capt. George W. Goddard

ON A HILLTOP NEAR MANILA STANDS THIS ANCIENT ROOFLESS RUIN

The massive Spanish convent of Guadalupe, founded by Antonio Herrera in 1601, was once the finest in the Philippines. It was set afire by shells during fighting in 1899 and virtually destroyed. In the background flows the Pasig River.

After a short delay, we went aboard the Clipper, once more stripped of all interior furnishings, since this was to be the long hop back across 2,400 miles of water. Mail sacks were high in the compartments and See and I pushed some of them into place to provide "bunks" during the long night flight.

Our take-off was brief and we climbed rapidly, circling as we gained altitude. We had not been in flight ten minutes, however, when No. 4 engine, the right outboard, began to miss fire. It was a faint sound and difficult to detect, as the four engines total fifty-six cyclinders.

Captain Tilton came down from the bridge and for once—the only time in the entire flight—his smile and friendly expression were gone. We might fly the entire route and have no more trouble with this engine, yet it was a risk that he chose not to take.

Department of Commerce orders are mandatory that, in a landing so soon after take-off with a heavily laden ship, an appreciable amount of the gasoline load must be dropped to insure a safe landing. With a muttered exclamation, he ordered the sea wings—each containing 790 gallons of gasoline—to be drained.

For more than twenty minutes we flew in a circle, all of Honolulu wondering at our delay. The falling gasoline vaporized as it hit the air and created a wide plume like smoke below us. Some believed we were afire.

Captain Tilton reassured the base, by radio, and asked if they were prepared to refill our tanks as we must come in for repair of No. 4 engine.



Photograph by P. Simpson

GLAMOUR SURROUNDS THIS OLD BELL TOWER IN GUAM

Generations of Chamorros have heard the sound of the bell, assembling the populace of Merizo for a mass meeting or sounding a fire alarm.



Photograph from William Burke Miller

IT'S A LONG WAY BETWEEN TRAFFIC SIGNS IN MID-PACIFIC

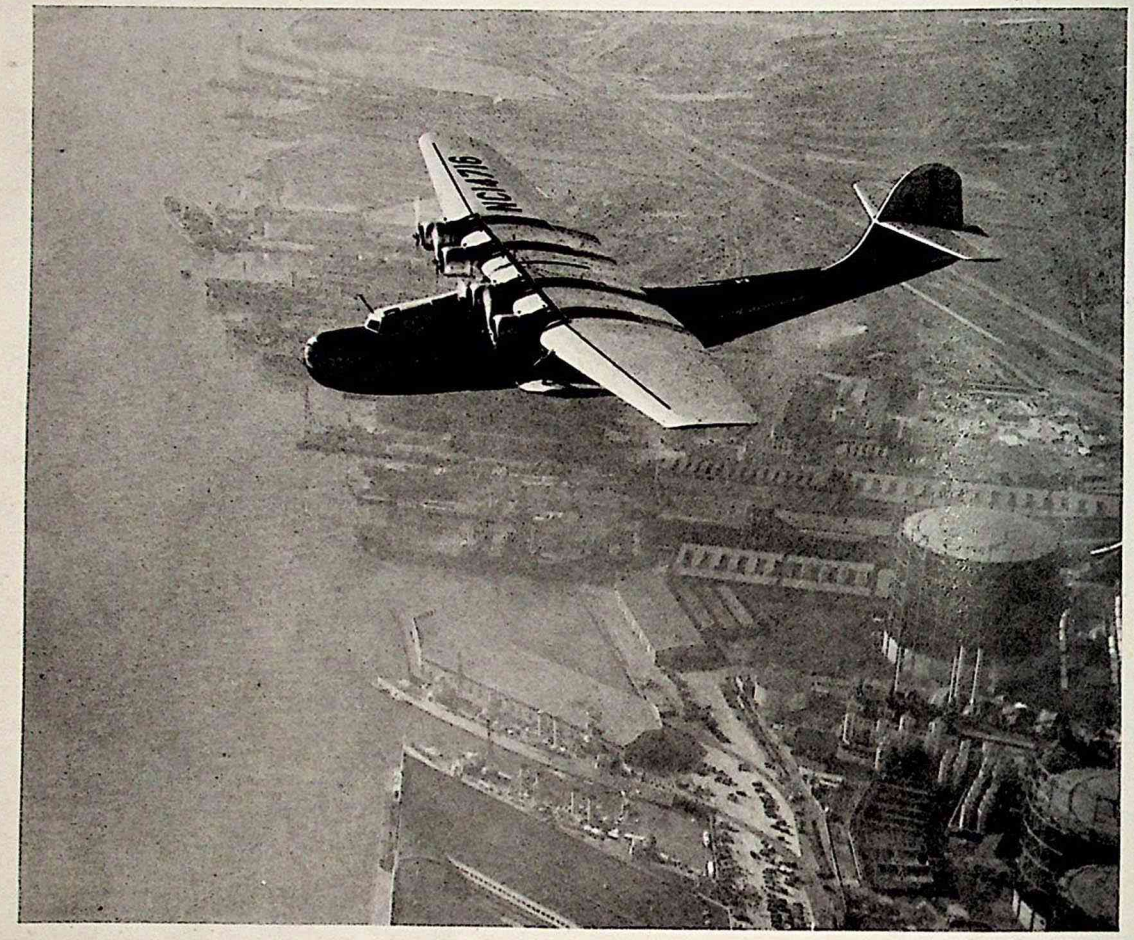
Harold See, National Broadcasting Company engineer and companion of the author on his flight, takes a dip in Wake's blue-green lagoon.



Photograph by Capt. George W. Goddard

MANILA, "VENICE OF THE EAST," IS THE WESTERN TERMINUS OF THE CLIPPER ROUTE

From here the giant transpacific planes head back across the ocean for Guam, Wake, Midway, Honolulu, and San Francisco (Alameda), while passengers bound for the mainland of Asia go on by boat or connecting plane. Conspicuous from the air at Manila are the Pasig River, arched by bridges, and the numerous intersecting canals. This view of the low-lying city includes part of the business section and busy docks. The Clippers now land near the Cavite naval station, a few miles away.



© Clyde Sunderland

BEFORE THE CHINA CLIPPER SEES OAKLAND AGAIN SHE WILL HAVE FLOWN 16,000 MILES

Every flight to Manila and back means a journey of nearly two-thirds the distance around the earth. The Clippers usually fly high above the clouds, as they cruise most efficiently in the thin air at an altitude of about two miles.

With the tanks emptied we settled again on the water and taxied in to anchorage. A quick inspection revealed that a blown spark plug was our trouble and it was immediately repaired. Within forty-five minutes the sea wings had been filled again and we were ordered aboard.

A GLEE CLUB OF THE SKIES

It was dusk as we mounted the sky and flew out over Diamond Head. Low clouds drifting in over the city and lights twinkling on here and there made a weird, eerie picture as we passed out to sea. The sun was low in the west behind us and ahead the east was dark and ominous. Winds were favorable though, and as darkness took command of the heavens stars twinkled and the moon appeared, clear and cold.

During our stay on Wake Island, we had discovered that several of the crew were singers and that Harry Canaday had been a glee club leader while he was studying at Annapolis.

Three hours out of Honolulu, we went on the air and induced the members of the crew not immediately engaged in flying the Clipper to sing Christmas carols, standing around the tiny tree in the lounge, and to send personal greetings to their families and loved ones.

It was a homesick and disappointed group. Captain Tilton arranged the schedule so that each member of the flight left his position long enough to hurry to the microphone.

The night grew cold and we flew on, our speed increasing as the winds bore more

favorably on our tail. Having no more broadcast schedules for the night, See and I sought out our berths on top of the mail bags. Protected by additional clothing we had borrowed in Honolulu, we were snug and warm and soon asleep.

SPARKS, AND BAD NEWS!

The quiet purr of the motors was broken shortly after 3 a.m. and we were awakened by a blinding streak of sparks whisking past the windows on the left side. So close were they that the brilliance of the stars was dimmed. There was an unsteadiness in the Clipper and as we made our way forward through the lounge, several ornaments on the tree crashed to the floor.

We learned that No. 1 engine—left outboard—was out of order, but no one forward was dismayed.

For a little while, the revolutions of the propeller were lessened and the back-firing and stream of sparks were less noticeable. Each man now was standing at his post, but there was no strain and no concern was visible in the faces of the crew.

We looked out on the dark water, ten thousand feet below, through cloud banks, and wondered whether we would have to land. We had been in flight eleven hours and were 1,625 miles from Honolulu. San Francisco was still about 780 miles ahead.

Now No. 1 engine was "revved" up again and there was considerable vibration in the ship. A stream of sparks slashed the blackness of the night. Crago came down from the bridge.

"Move about as little as possible," he called out. "The automatic pilot is cut off now and we are flying manually."

We tip-toed to a seat in the navigation cabin, looking out directly on No. 1 engine. For forty minutes or more, it was alternately spitting fire, gasping, and dying to a whisper.

We learned from the Captain, who came down from the bridge momentarily, that No. 1 engine was being used to pump gasoline to the other three motors and it would be cut off as soon as the pumping was completed.

"Can we fly on three motors?" I asked. The Captain's twinkling eyes and grin answered us. "With a little less gasoline load, we could fly on two," he declared. "We are all right; don't worry; but we won't make a record into Alameda."

We looked out on the black water below and wondered, but the Captain's smile was reassuring.

It was cold sitting around, so we slipped back to a rear compartment and burrowed down under the mail sacks again. We did not intend to sleep but to listen and watch the sparks fly past our window.

The next thing we knew, dawn was breaking and the ship was steady once more. Getting up stiffly, we walked forward. Peering out a window in the lounge, we saw the propeller of No. 1 engine was still, its nacelle streaked with oil, black and grimy.

FLYING WITH A DEAD "PROP"

What a queer sensation you feel the first time you look out at a dead "prop" and realize that somehow you are still flying. But it was simple.

Three motors were now carrying us, aided by a forty-mile tail wind. It required more exact operation of the other three motors and more skillful piloting to keep on the course, but this crew of the Pan American Airways was equal to the emergency and our flight continued, retarded but not interrupted.

We began to hope again that the tail winds might bring us in with a new record, but it was not until 16 hours after our departure from Honolulu that, through the fog, we saw the California coast.

We were south of San Francisco and, turning, we flew on, skirting the shoreline.

In another hour, we picked out in the mist the skyline of San Francisco. Circling lower and lower, the Philippine Clipper settled, a little wearily it seemed to us, on the water just outside the breakwater.

We taxied inshore to a throng gathered in the grayness of the afternoon. They were there—not to welcome us—but to watch a trial flight of the China Clipper, which was even then on the ramp, the crew motioning for us to stand off so that they might get under way.

And thus our flight was done—17 hours and 17 minutes after our take-off from Honolulu, and 58 hours, 43 minutes actual flying time since leaving Manila.

A sigh escaped us as the China Clipper roared off over the water. Our adventure was over. To Pan American Airways their new route was established and operating.



Photograph from Wide World

THREE 'ROOS "FLOAT THROUGH THE AIR WITH THE GREATEST OF EASE"

This remarkable photograph was made during a kangaroo roundup on a sheep ranch, where the animals sometimes encroach on the pasturage. In giving chase, horsemen run them parallel to the fences; otherwise they would jump the wire barriers as easily as they leap this wide gully. Some kangaroos can cover 30 feet in a single bound, and may outstrip a horse for a short distance (page 712 and Plate III).

BEYOND AUSTRALIA'S CITIES

By W. Robert Moore

With Illustrations from Photographs by the Author

"AUSTRALIA'S vast lands have been colonized by sheep and cattle, but not by people," commented my Australian companion as we lingered over breakfast aboard the Melbourne Express.

Although not receptive to epigrams so early in the morning, I still could appreciate his summary of the development of this southern Commonwealth in Britain's globe-girdling Empire. There *are* nearly 17 times as many sheep and twice as many cattle as people in the country. Thriving cities have grown beside harbors and coastal rivers,* but spacious portions of the continent are largely empty. There is a reason.

Australia is almost as big as the United States, but its vast face presents a striking contrast to the American landscape. This ancient eroded land mass has no extensive mountain ranges, no great river systems. The granite ridge of Mount Kosciusko, 7,330 feet above sea level, in the southeastern corner of New South Wales, is the highest point on the continent (page 740).

For 900 miles along the southern coast there flows not a single river. Many other miles are little better served, as existing stream beds are often dry for many months.

The Murray-Darling is the one large river system of the continent. From its source in the Queensland highlands, less than a hundred miles from the coast, to its mouth at the sand reef of The Coorong, southeast of Adelaide, the stream travels 2,310 miles. Except for length, however, it is no Mississippi. Its drainage area is much smaller, and much of the water is lost before it reaches the main channel.

PIONEERS—HERE AND THERE

Where American pioneers in their westward march from the Alleghenies progressively found well-watered fertile lands awaiting their plows, Australian pioneers were baffled by sterile inland areas where they could find not even water to drink.

Lakes that were only colossal salt pans; rivers that were dry or stagnant with brine; and vast rocky and sandy wastes—such were the reports that Sturt, Eyre, Stuart, and other Australian explorers brought back from the interior where their parties had suffered untold privations and harrowing hardships. Leichhardt marched inland and vanished. Burke and Wills perished of starvation on Cooper's Creek.

But Australia is by no means entirely desiccated. Indeed, along the coastal belts and extending for several hundred miles inland the land is flushed with fertility. A broad band of vegetation extends along the north, east, and southeast edges of the continent, covers a wide triangle in the southwest corner of Western Australia, and blankets most of Tasmania.

FERTILE LANDS AWAIT MORE SETTLERS

Its development is a fascinating story. Here, within the short span of a century, resourceful Australian settlers have carved out farms and pasture lands so big and productive that they help to fix the price of the world's bread and meat and clothing. Here they have reared bustling commercial marts with world-wide interests and growing population—Sydney and Melbourne claim more than a million people each.

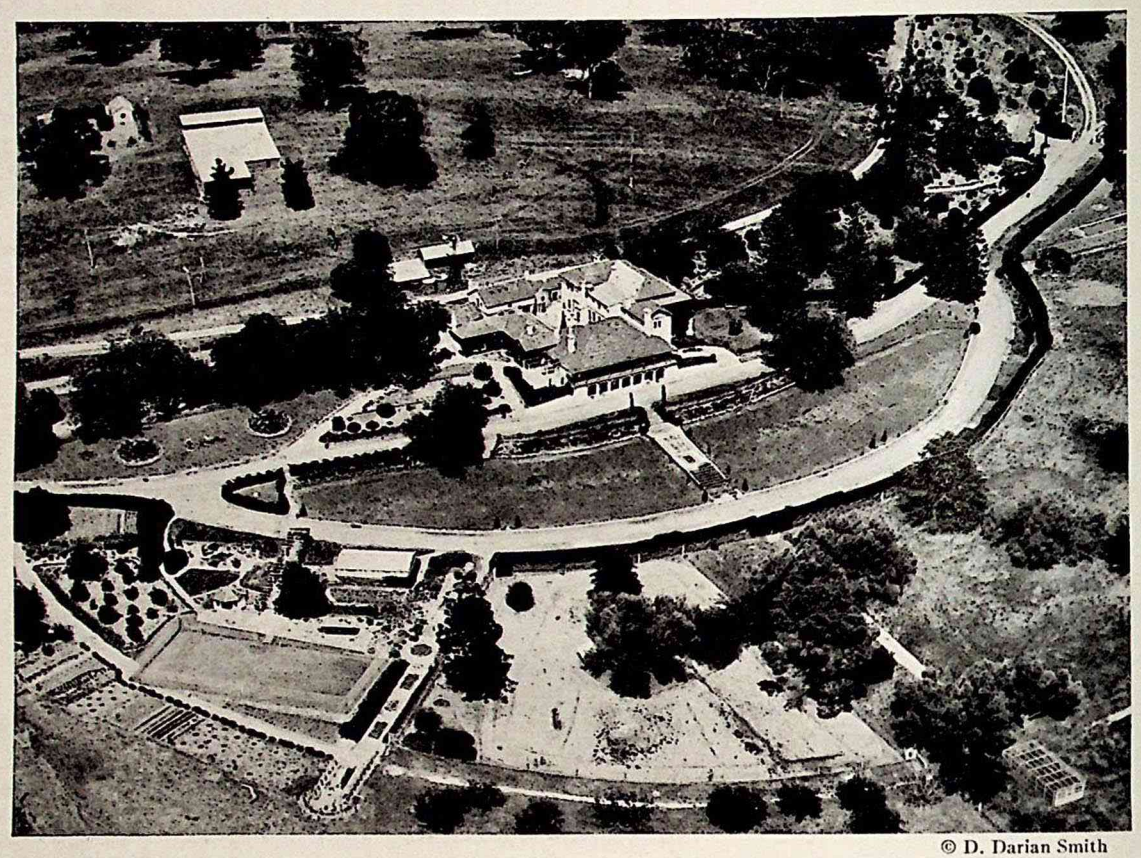
Frontiers move farther inland, but even the most conservative authorities estimate that, in already developed lands, the present population could be quadrupled without congestion.

A striking feature of Australia today is the concentration of more than 62 per cent of her entire population in the six capital cities and the urban centers. Yet, paradoxically, beyond the cities and extending to the far horizons of "way out back" are found the Commonwealth's chief resources.

Mobs of sheep are grazing across endless plains; cattle are bawling beside water holes and kicking up long banners of dust as they move on muster; seas of golden wheat ripple beneath sunny skies; in eucalypt forests axes ring; and from molelike burrowings in the earth men are bringing up minerals to feed factories and gold to be stacked in the world's treasure vaults.

"An improbable dream of a visionary enthusiast"—such was the libel that Australia's first settlers attached to the idea that the country might become a prosperous sheep land. Some were positive that

* See "Capital Cities of Australia," by W. Robert Moore, National Geographic Magazine, December, 1935.



© D. Darian Smith

HOMES ON BIG PASTORAL STATIONS OFTEN SUGGEST ENGLISH MANOR HOUSES

This estate is about 60 miles north of Adelaide, in a region where ample rainfall usually insures rich pasturage. Droughts, which sometimes menace large areas in Australia, seldom affect this locality. When they do, the damage is minimized by an extensive water system (page 733).

the flocks could not thrive on Australian grasses, which are dry during the summer months, and, even if they did, the wool would deteriorate to scraggly hair in the hotter climate of the continent.

THE ROMANCE OF WOOL

But Captain John Macarthur, one-time of the New South Wales Corps and somewhat of a political firebrand in the infant period of Australia's settlement, thought otherwise. Therein lies the romance of an industry that has few parallels in commercial history.

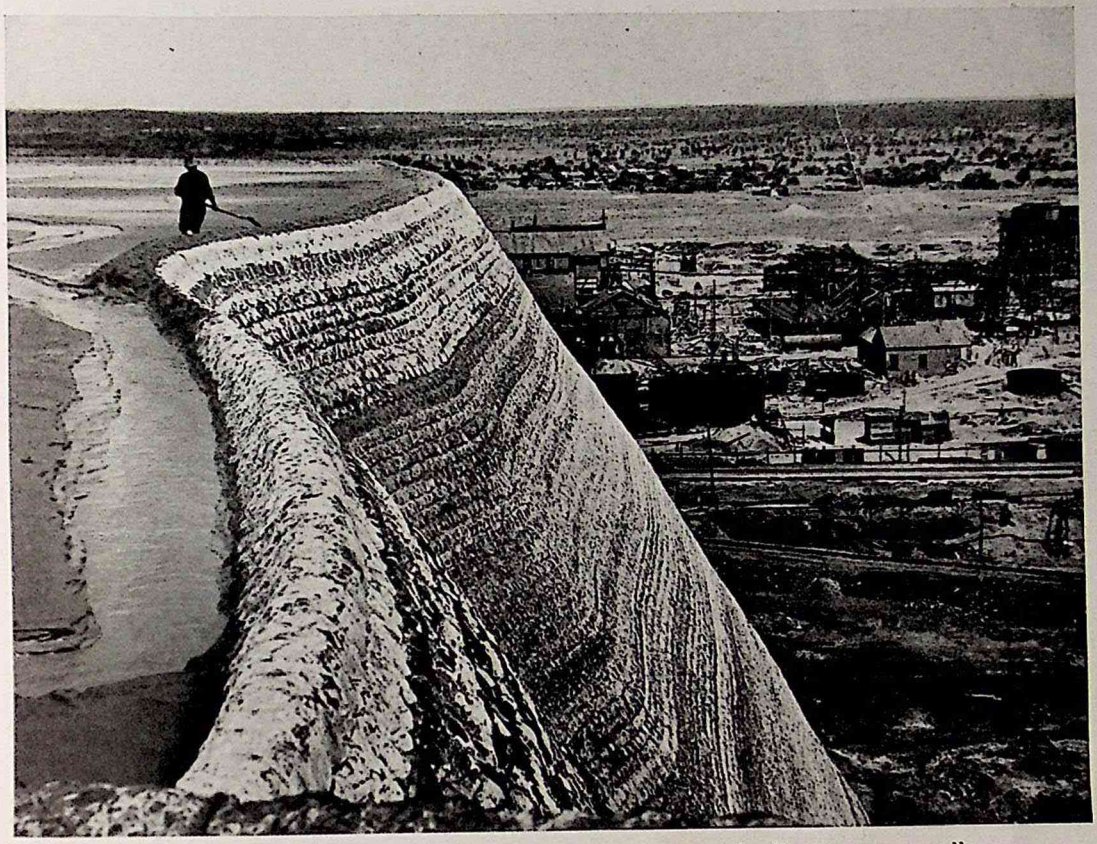
Wool has been to Australia what cotton has been to the American South. Today a fifth of the country's productive wealth is carried on the backs of her sheep. From the meager flocks with which Macarthur and other pioneers began their systematic breeding, there has grown the amazing total of more than 114 million animals, which supply between a fourth and a third of the world's wool requirements (page 724).

It is not surprising that the Australian merino is often called "the uncrowned King of Australia." If ever an animal could claim such a royal title, it is this sheep. Not only has he been of paramount importance to the financial well-being of the Commonwealth, but his forbears came from the Spanish merino by way of Good Hope and also from the private flocks of King George III.

PORTRAIT OF ANCESTRAL RAM

At one station home I visited, a large photograph hangs, like an ancestral portrait, above the mantelpiece in the study. It is of old David, an Australian merino ram, whose purchase price was more than $25,000!

The generations of sheep breeders that followed Macarthur's footsteps have taken their flocks over wide areas of the continent. Through increased watering facil-



MAN-MADE MOUNTAINS RISE BESIDE KALGOORLIE'S "GOLDEN MILE"

To pile up the tailings of finely pulverized rock that are flooded on the dump from the gold extraction mills, workmen shovel up an outer retaining wall, which hardens almost like concrete. Countless spade marks line the face of the huge mound. Some dumps are 250 feet high and contain two million tons of refuse (page 742). Much of the water is used again, as Kalgoorlie's supply has to be piped more than 300 miles.

ities, by means of artesian bores, millions of animals now are ranging in regions once considered useless.

As the world's wool-hungry mills have increased their demands, so station (ranch) owners also have increased the weight and quality of the fleeces.

Today the average clip (including lambs) has risen to eight-and-a-half pounds, twice that of pioneer days; but I saw some wrinkle-necked old merino rams that were carrying the equivalent of seven suits of men's clothing on their bodies. In length, fineness, and strength of its fiber Australian wool is unsurpassed.

So important has been this emphasis on careful breeding that some stations have devoted their efforts exclusively to producing high-class rams. Wanganella and Boonoke, near the Victorian border of New South Wales, are two of many famous studs.

All over Australia and even abroad their stock is known. From Boonoke's flocks alone, sheepmen have purchased two-and-a-quarter million rams in the past thirty-four years.

"Only two percent of our rams are selected for breeding purposes," remarked the youthful manager of Boonoke one day as we motored over the sheep runs. "Our flocks here haven't had any outside blood introduced into them for more than half a century."

A SHEEP RANCH IS A SELF-CONTAINED COMMUNITY

A sheep ranch is a complete community in itself. It usually has its own post office, telegraph station, and power plant. Although not on the sumptuous scale of some of the palatial residences of the Argentine pampa, many of these commodious station homes, surrounded by flowering gardens,

are perfect in every appointment and convenience (page 710). In some respects they are the Australian equivalent of old English manors.

Beyond each central residence is clustered a full complement of barracks and houses for the station hands and families; also stables, blacksmith and machine shops, laundry, butchery, and bakery. And outlying those are the long corrugated-iron woolsheds and stock pens.

Life is unhurried in these nerve centers of the country's chief industry. The manager seldom assigns more than one task a day to his men. Some days they do little, but they are always ready to work long fatiguing hours when the occasion demands.

By the sweat of their own brows most owners have built and managed their own estates. While there are some absentee owners, by far the majority know the meaning of work. Sons, too, grow up in the business. On many stations one finds these young "jackaroos" working to fit themselves to become station managers.

A SHEEP-COUNTRY GENTLEMAN'S LIFE

With perhaps forty men under his direction, a manager's life is a busy one. There are always inspection trips to see the condition of water and grass on the runs, repairs to be maintained, and a multitude of other tasks to keep the station going.

Every evening while I was at Boonoke, my host was at his telephone promptly at eight o'clock to carry on his share of the many-sided conversation among the several stations operated by his brothers and other relatives. With station business over, it was usual to prolong the conversation by friendly gossip and the usual "Stop me if you've heard this one!"

Here in the saddle most of Australia's polo players gain their training. The men also find recreation in hunting or tennis. Some even have their own golf courses and racecourses where horses are trained for the popular country or "picnic" race meeting.

The wives of the managers are cultured and many have traveled widely. In the outback it is rather surprising to find people so conversant with the latest books, music, and, of course, the races.

Before telephones and radios came, station life was more isolated. Motorcars and even airplanes in many places have brought distant towns next door. Gone now to many are the long journeys by horseback and carriage.

One of the most remarkable things to me, as I traveled through the sheep districts, was the comparative absence of sheep on the landscape. When I once commented on it up in Queensland, one station man said that he had traveled a thousand miles through one region where there were a million sheep being pastured, yet on the whole trip he had not seen a single sheep!

SHEEP TO ACRE IS RAINFALL INDEX

At Boonoke, where there are about a hundred thousand animals, the plains seemed empty. The flocks are broken up into smaller groups and have their own separate runs, but even on the fertile grasslands of that station there is less than one sheep to the acre. In more arid regions the acreage is considerably greater.

As we sped across the rolling plains of one station in an American truck, we saw dozens of kangaroos rise up like posts above the grass and then take to their heels as we approached. Detouring from an inspection of subartesian wells, we gave them chase.

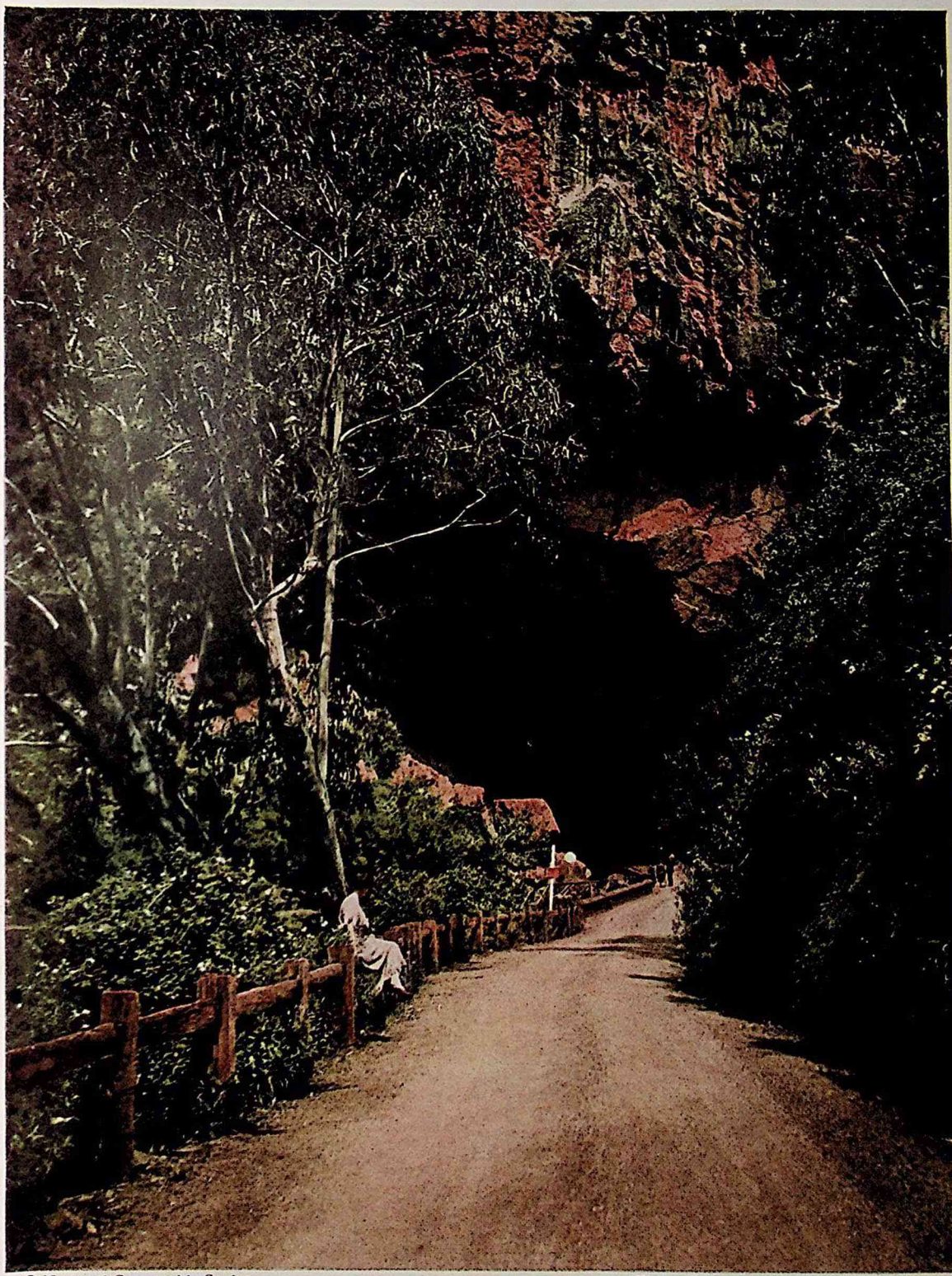
Propelling themselves with only their powerful hind legs, with their tiny undeveloped front legs held high, their running seems uncanny (page 708). But as our speedometer touched 45 miles an hour, one old kangaroo kept pace beside the car.

Dozens of others raced away and bounded with ease over the high fences that surrounded the paddock. A few emus, reminding one of bustled ladies trying to hurry, trotted off across the pasture lands.

SHEARING DONE WITH FACTORY RHYTHM

Shearing time is the station's busiest period. Then all of the sheep have to be mustered and brought to the sheds. The clocklike precision with which the whole routine is carried out is amazing; it moves with the rhythm of a great factory. A steady flow of sheep must be brought to the shearers, who clip a hundred to two hundred each daily; some have recorded the amazing tally of 245!

If the animals arrive faster than they can be handled, food in local corrals is soon exhausted or trampled underfoot. For that reason the flocks are handled in relays. Imagine the planning required to bring them to the paddock at the right time when some of the mustering camps are 50 to 100 miles from the shearing sheds!



© National Geographic Society Finlay Photograph by W. Robert Moore

IN AGES PAST A RIVER CARVED GRAND ARCH AT JENOLAN CAVES

Entering this natural tunnel, the motor road passes through a barrier of soluble limestone spanning a valley. From the walls of the arch, narrow passages lead to the grottoes of this underground wonderland, about 115 miles from Sydney. Delicately colored pink, white, and brown limestone formations fill the caverns with fantastic castles, people, trees, and birds.



© National Geographic Society

Finlay Photograph by W. Robert Moore

NEW YEAR'S DAY VACATIONISTS SPRINKLE BRIGHT COLORS ON BONDI BEACH, NEAR SYDNEY

Here and at near-by Bronte, millions of people swim each year. Numerous other bathing places fringe the Pacific and spacious Port Jackson.



© National Geographic Society

"NO MORE TILL YOU FINISH WHAT YOU HAVE!"

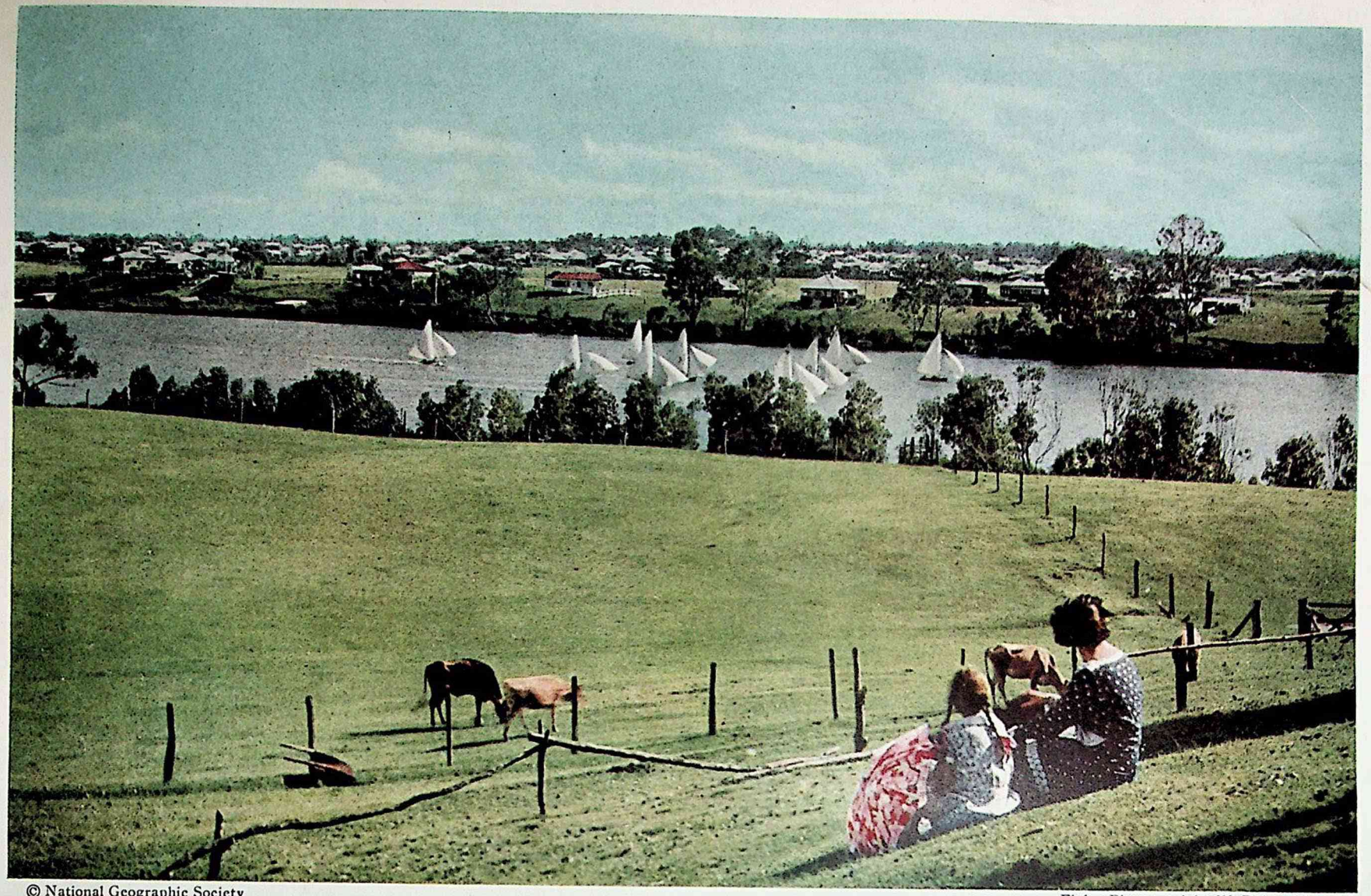
Just after this picture was taken, in a park near Sydney, the kangaroo cuffed the girl, demanding more food. When Captain Cook landed in Australia in 1770, his crew marveled at the strange creature "as large as a greyhound . . . and extremely swift . . . called by the natives Kanguroo."



Finlay Photographs by W. Robert Moore

"TEDDY BEARS" MAKE FRIENDS WITH A PARK VISITOR

Roly-poly koalas, Australia's native bears, are marsupials, like kangaroos and opossums. Here a half-grown cub (below), too big for its mother's pouch, clings to her furry back. Above them a koala reaches for one of the eucalyptus leaves that form this tree-dwelling animal's staple diet.

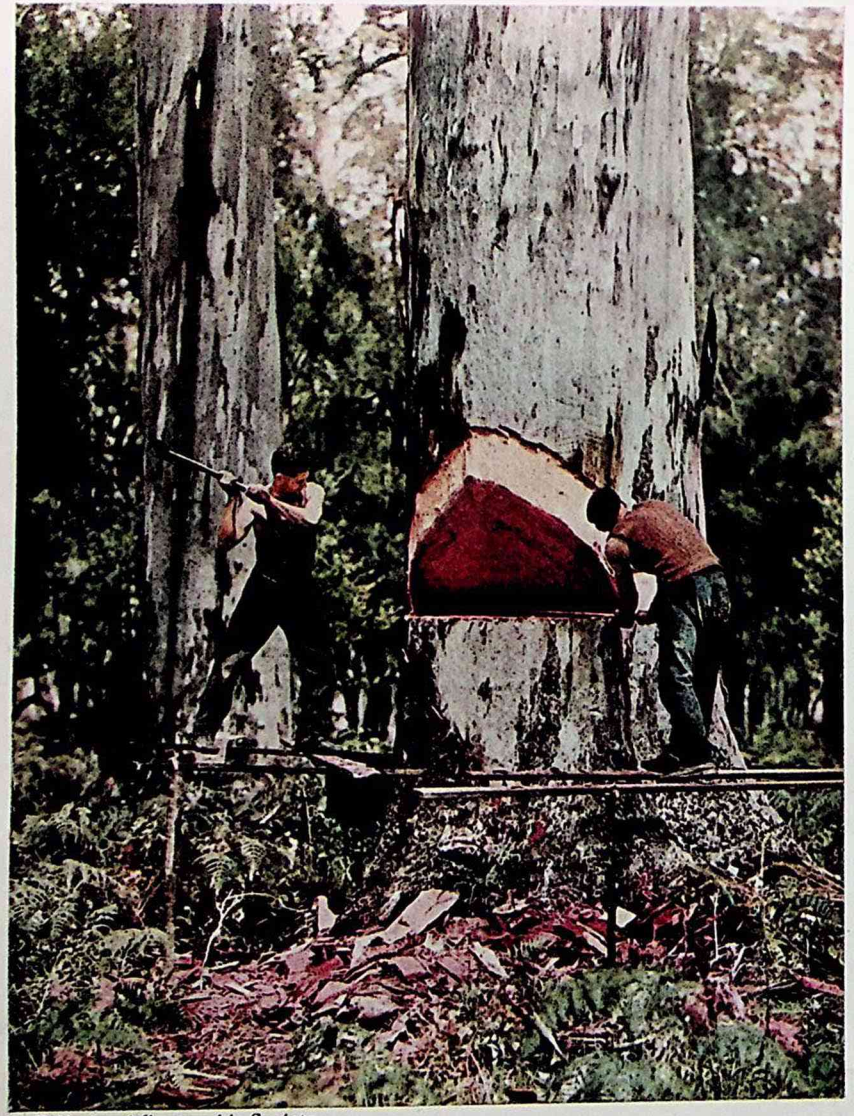


© National Geographic Society

Finlay Photograph by W. Robert Moore

WITH SPINNAKERS SET AND DRAWING, BRISBANE BOATS RACE BEFORE A TROPICAL BREEZE

Winding through green fields dotted with cottages, the Brisbane River is a favorite course for yachting enthusiasts of Queensland's capital. Along with cricket and horse racing, sailboating is a popular sport in all the coastal cities of Australia.





© National Geographic Society

Finlay Photographs by W. Robert Moore

MORE THAN 300 SPECIES OF EUCALYPTUS TREES ARE NATIVE TO THE AUSTRALIAN CONTINENT

Popularly termed "gums" or "eucalypts," they dominate the Commonwealth's landscape. Here two woodcutters hack away at a giant karri (*Eucalyptus diversicolor*), whose hard wood is often used for paving streets. These trees sometimes shoot up 180 feet before branching. Forests of them in Western Australia cover an area about a third the size of Rhode Island. The red gum (right) stands in National Park, south of Sydney, where a large tract of native bushland is preserved.

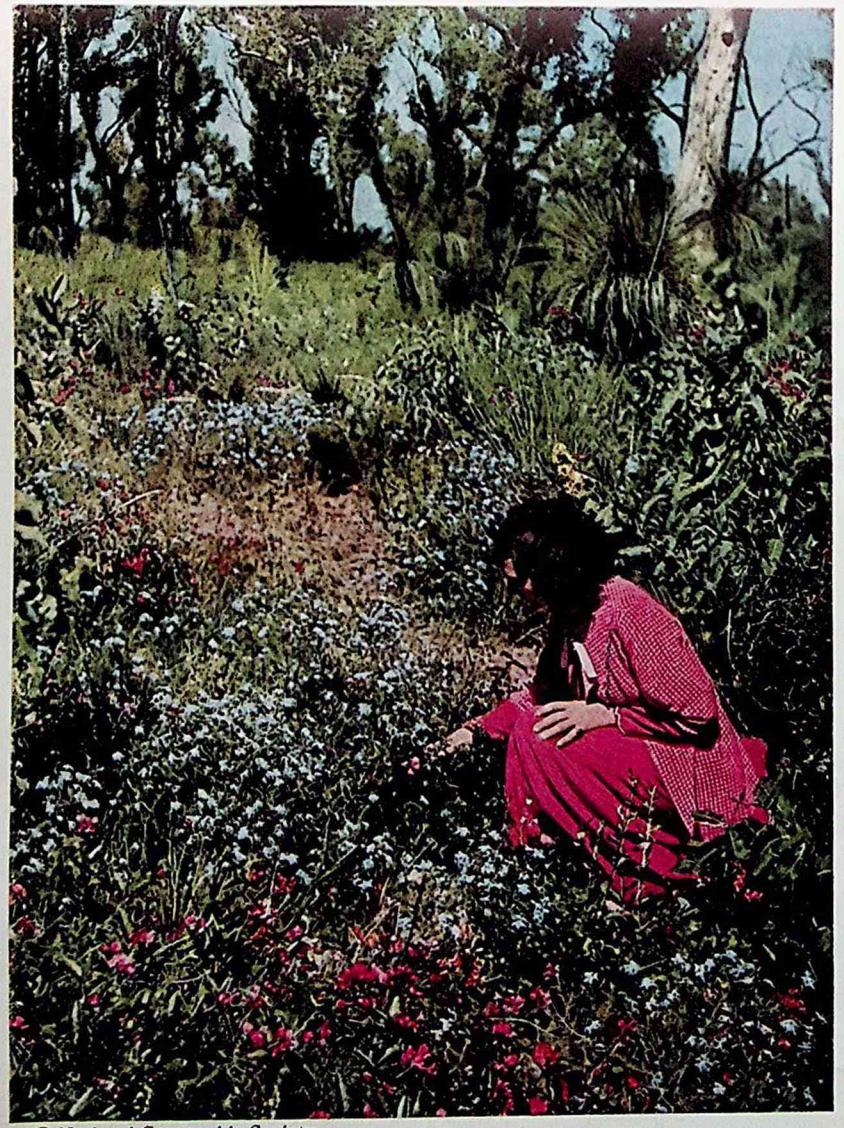


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Finlay Photograph by W. Robert Moore

"SALVATION JANE" IS A SOUTH AUSTRALIAN NICKNAME FOR THIS PURPLISH-BLUE WEED

Its blossoms resemble hooded bonnets worn by Salvation Army lasses. Another reason for the name is that, during a drought a few years ago, cattle survived by grazing on this nitrogenous pest, *Echium plantagineum*, which blankets acres of many localities. Known in other parts of Australia as "Paterson's curse," the plant is akin to the blueweed of the Shenandoah Valley of Virginia.



© National Geographic Society



Finlay Photographs by W. Robert Moore

SPRINGTIME CARPETS WESTERN AUSTRALIA WITH BRILLIANT WILD FLOWERS

Vast fields are often covered by a single variety. National Park, in the Darling Range near Perth, is paved with a flower mosaic in September and October. Blue Leschenaultia (left) is one of the State's most popular wild flowers. Behind the lilac-colored blooms (right) is a young grass tree, or "blackboy"; when grown, the short trunk is usually blackened by bush fires, and the plant roughly resembles a native wearing a grass headdress.



PALMS AND BOUGAINVILLEA SURROUND A BRISBANE HOME

Numerous other tropical and subtropical trees and flowers thrive in the warm, moist climate of the Queensland capital. Homes are often built off the ground, some on posts six feet high, to improve ventilation and to prevent the floors from getting damp during the rains.



© National Geographic Society Finlay Photographs by W. Robert Moore

AUGUST SHOWERS BRING FORTH SEPTEMBER FLOWERS IN WESTERN AUSTRALIA

The little girl's yellow blossoms are from acacias, known as wattles in Australia, because early settlers used their branches as the framework or wattle for mud huts. The red blooms are *Watsonia iridifolia.*

Cartage of wool to market is likewise operated with precision. Railway timetables must be considered; freight cars have to be ordered in advance, and then dispatched on schedule. Delays anywhere along the line may mean appreciable losses at the salesrooms.

Many means of transport are utilized in getting the wool to its destination. Today motor trucks are in some measure replacing other conveyances, but during wet months on the black-soil plains of the Riverina, in New South Wales, they are at immediate disadvantage.

BULLOCKS AND CAMELS HELP TRANSPORT WOOL

Bullock teams, although painfully slow, are sure. They haul the heavy, high-wheeled wagons, piled with tons of wool, over boggy terrain and on zigzag hill tracks that seem almost insurmountable (page 725). But it is a sizable bog indeed that can stop 36 tugging bullocks!

Horse teams travel faster, but they require more attention than the bullocks. To see a 20-horse team strung out in tandem pairs or fours, straining at a miring wagon carrying ten tons of wool, is an unforgettable display of power.

Out by Broken Hill and in other semi-desert regions many camels are used. Some are ingloriously hitched to wagons like horses, except that their collars are turned upside down to fit their necks. Others carry bales slung pannierwise over their backs, and as they swing along to the command of their Afghan drivers, one almost feels that he is somewhere in the region of the Khyber Pass, rather than in outback Australia.

In a few places wool goes out by boat. But whatever may be its transport, out it goes with as great dispatch as possible.

From sheep's back through auction mart to ship's hold, the wool industry has many ramifications. It is considered that in one way or another at least a third of Australia's population is connected with the trade.

But just consider: there are about a *billion* pounds of this golden fleece (sometimes more) to be taken each year from the sheep, graded, baled, transported, sampled, catalogued, auctioned, rebaled, and carted to mills or shipped abroad!

Such is the industry that in recent years has poured an average of some $250,000,000 into Australia's purse. In boom years its revenue has been nearly doubled.

STATIONS MEASURED IN SQUARE MILES—NOT ACRES

"How large a station do you have?" I asked a manager one day after we had traveled miles across rolling prairie lands and had opened a dozen rabbit gates.

"Oh, 155,000 acres—and a little more."

Later, when he gave me the actual figures, that "little more" proved to be about 600 acres—quite a sizable farm in itself!

Many are much larger. But the days of the "wool kings" are no more. Small owners with flocks numbering less than 5,000 predominate.

Out in the more remote regions of Queensland, Northern Territory, and Western Australia, and in the arid center of Australia, however, cattle properties are still measured in square miles, not acres.

Picture a single cattle station larger than Massachusetts and Connecticut. Look at it also as a band five miles wide extending all the way from New York to San Francisco; or, fantastic thought, a land path more than a mile wide all the way from the farthest side of Australia to Maine! For it is 13,000 *square miles!*

A RANCH OF MAGNIFICENT UNFENCED DISTANCES

One cattle man, whose station lies on the Queensland-Northern Territory border, told me quite casually that it was a 125-mile horseback journey from his back porch to the back line of his property.

Like many of the older holdings, none of his land is fenced, so the cattle often stray far afield.

During the summer months they move southward into the prevailing winds to rid themselves of the myriad flies that pester them. Consequently, the station hands often have the task of riding 250 miles to get their stock back to their own property. The herds also may wander forty or fifty miles in the direction of storms if they lack water.

Early one morning I flew out to a cattle station, 300 miles into the Queensland interior, landed in a field near the house, and taxied up to the gateway.

The station is not large as many of the inland stations run, but it is a goodly block of land—1,200 square miles—pasturing 25,000 head of stock!



"FRUIT SALADS" GROW READY-MADE ON THIS QUEENSLAND PLANT

The fleshy, coblike spikes taste like a rich mixture of fruits. A member of the arum family, the *Monstera deliciosa* has perforations in its wide leaves, so sunshine reaches the base of the plant.

As we rode its ranges, I saw one herd of 1,500 steers that had just arrived from a four months' trek of a thousand miles down from the gulf country. From the fattening paddock where they grazed to market was still another 200-mile overland journey.

BRANDING AND SORTING THE HERDS

Upon food and water hinges success or failure. How many times tragedy has stalked beside dried-up water holes and parched pastures! Whole herds have perished in rigorous seasons and the strenuous labor of cattlemen has come to dramatic nought.

As shearing is the big event on sheep stations, so mustering for branding and sorting is the chief activity on cattle ranches.

Herds on this property are handled from 15 mustering camps and it usually takes four to six months to complete the work.

Here, where life is attuned to the ceaseless moan and bellow of cattle about water holes and in branding corrals, the American Wild West is reflected in ten-gallon Stetson hats that have come into fashion in the last few years.

But the swaggering cowhand with a handy lariat and a pair of six-shooters strapped on his thighs is unknown. Australian cattlemen, instead of roping their beasts for branding, in most cases pen them and hold them in a system of gates (page 728).

"Do you have any cattle rustling?" I asked one day as a shower had temporarily halted branding operations.

"We call it 'duffing' here," replied the manager. "But it's very rare. Distances are too great; it doesn't pay."

One story that I heard later stands out as an excellent example.

It seems that two men desired to increase their stock, so when rains had filled water holes along the way, they rode 250 miles to a station and drove off about 300 cattle. The ranch owners and police

tracked the animals down and brought them back, together with the culprits.

The men were then committed to stand trial in Darwin, nearly a thousand miles away. Eventually one man pleaded guilty and was sentenced to five years' imprisonment. For lack of evidence the other man was released. But by the time he got home again he had traveled nearly 3,000 miles!

Far out in the interior, remote from railways and easy means of transport, station homes have fewer amenities. There are no electric lights, no refrigerators. Water in canvas sacks is cooled by evaporation on the shady verandas. Yet life is pleasant, and afternoon tea is an established custom. The radio, magic destroyer of distances, brings the world's news and music to the family living room.



Photograph by Otho Webb

A PERT COCKATOO CHATTERS TO HIS ABORIGINAL OWNER

Like other parrots, these birds can be taught to enunciate words and phrases. Of the eleven species in Australia and Tasmania, this sulphur-crested white cockatoo is the best known. Galahs, or rose-breasted cockatoos, also appear in large flocks almost throughout the continent. They dig roots, seeds, and bulbs with their strong hooked beaks.

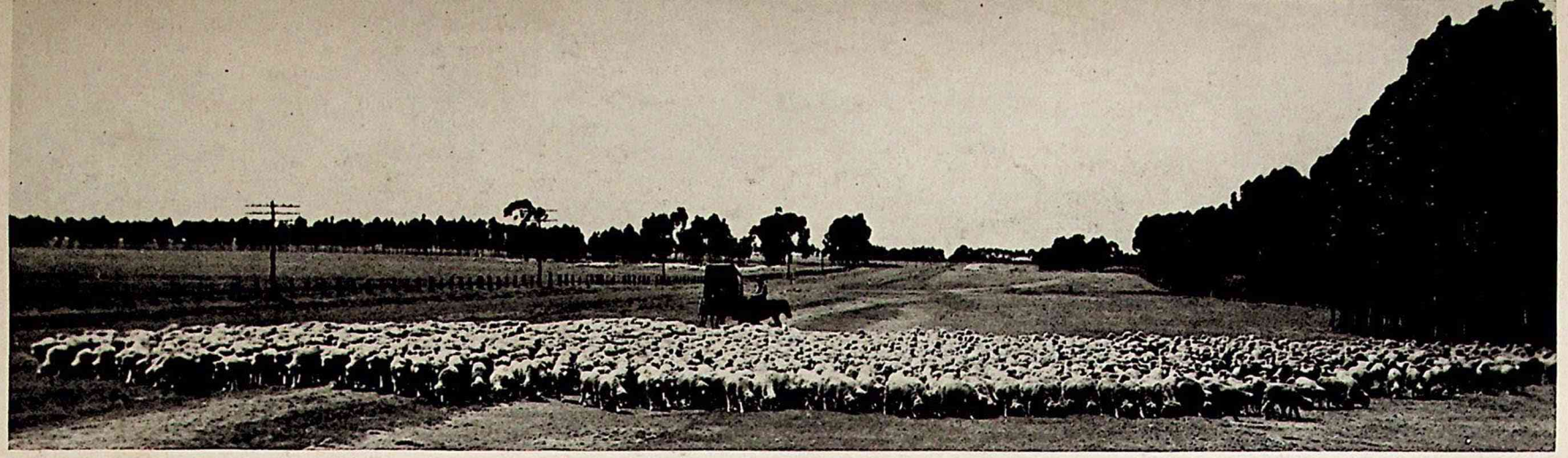
DOCTORS PRESCRIBE BY RADIO AND FLY TO PATIENTS

Across the vast region, popularly dubbed the "back of beyond," ether waves crackle in the evening with friendly chatter between neighbors perhaps fifty or a hundred miles apart, for many stations are equipped with hand-operated radio sending sets.

Doctors from many times that distance prescribe remedies to patients when these radios relay to them the symptoms of a case.

Out here the airplane has likewise proved its worth, for flying doctors now race hundreds of miles on their errands of mercy. Now and then, too, a flying parson may drop in on a station to hold a service.

The Government maintains a system of stock routes and tends them with religious care, for they are the arteries of a far-reaching enterprise. Across dry areas they wind and twist to touch every available spring, stream, and *billabong*. And where



THE AUSTRALIAN BLEATING "MOB" WENDS SLOWLY OVER A BROAD ONE-WAY STOCK ROUTE

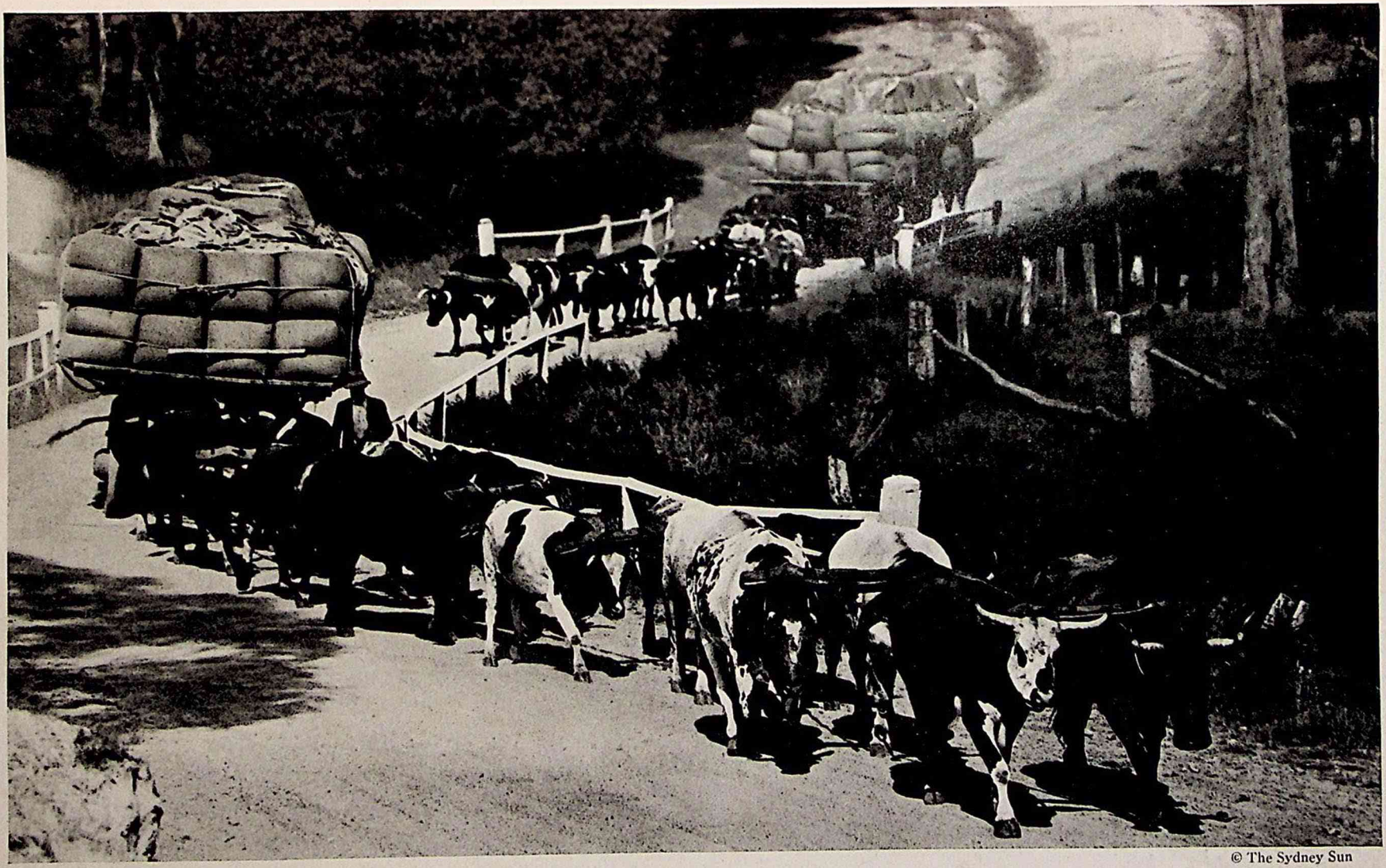
Accompanied by his cook wagon, the herder drives some 2,000 sheep and lambs to fresh pasture lands in western Victoria.



© The Sydney Morning Herald

DRONING HARVESTERS CUT, THRESH, AND BAG WHEAT IN ONE CONTINUOUS OPERATION

Often grain is left on the stalk until ripe, then is quickly harvested by these large combines. Some of the strippers and harvesters are Australian inventions (page 732).



© The Sydney Sun

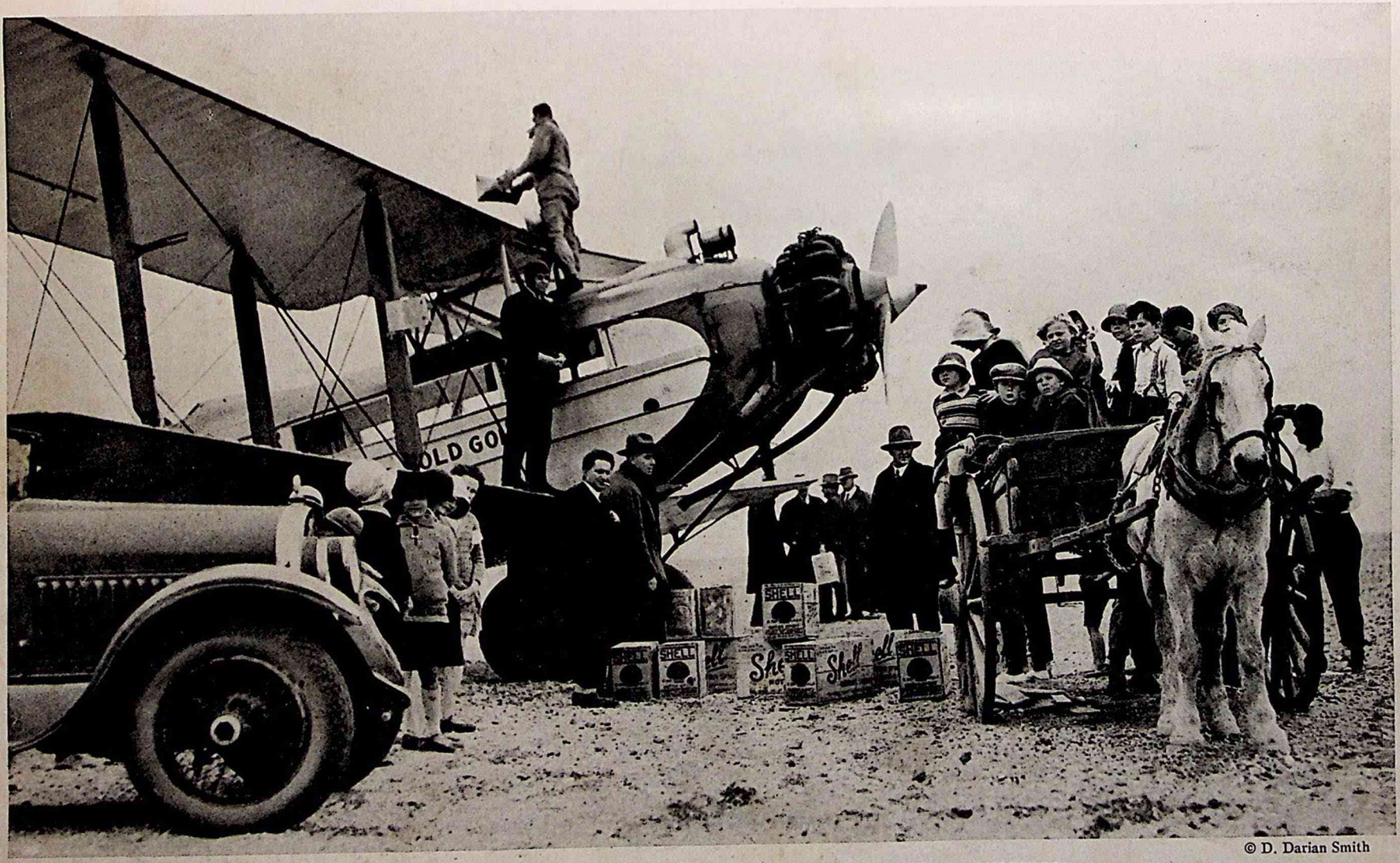
"BULLOCKIES" SHOUT TO THEIR TEAMS AND HEAVY YOKES CREAK AS WOOL WAGONS HEAD FOR THE RAILROAD

Bullocks are painfully slow, but require less attention than horses. Two wagons are usually dispatched together, so that if one gets bogged the teams can be doubled to extricate it. Since train schedules have to be considered and freight cars ordered in advance, wool transports must reach the railroad on time (page 721). Motor trucks have replaced wagons in many localities.



"MUSTERING" CATTLE IN A LITERAL CLOUD OF DUST

Hundreds of hoofs clump billowing plumes of dirt into the air, so that at a distance the roundup looks as if a grass fire were following in the wake of the horned "mob." For some of the herds on inland stations, a 1,000-mile journey on the stock routes is not an unusual trek (pages 722, 728).



© D. Darian Smith

PLANE MEETS ROADSTER AND HORSECART OUTBACK IN CENTRAL AUSTRALIA

In this sparsely populated area of scanty rainfall, the appearance of an automobile is scarcely less an event than the sight of an airplane. Children of this district clambered into the two-wheeled cart and hurried out to see the ship, which had landed to refuel. Many stations have private airplanes so that owners may inspect their vast ranches; physicians prescribe by radio, and fly to patients' bedsides (page 723).



HOOFS POUND AND DUST FLIES AS A QUEENSLAND COWHAND BRINGS IN A STEER

When cattle are driven in from the grazing lands on this 1,200-square-mile station, the horsemen cut out single animals from the "mob," or main herd. Some are run into pens for branding, others are separated into different lots to be fattened for sale. Lassos are seldom used, and ten-gallon hats are a comparatively recent innovation among Australian cattlemen.

these are inadequate, artificial water supplies have to be maintained either by wells or artesian bores, with their long strings of drinking troughs.

STOCK ROUTES LIKE CARAVAN TRAILS

Australia's land map is sketched with a number of these long snaky paths which radiate out to railways and seaboard cities.* One begins up in the tablelands of Northern Territory and reaches out to the railheads of Longreach, Winton, and Charleville to serve Townsville and Brisbane.

Another starts up in southwestern Queensland, swerves through the northeastern corner of South Australia, and follows down the western boundary of New South Wales until it contacts the railway at Cockburn, to find eventual outlet at Adelaide.

A third trail connects the Kimberley region of Western Australia with Wyndham, whose meatworks operate during the winter months. In Western Australia, too, another seemingly endless meandering line ties the railheads thrust out into the interior with the expanses of Northern Territory.

HERDS STOP OVER FOR FATTENING

On these tenuous channels, hundreds of miles in length, you see streams of steers moving out toward the ports, eventually perhaps to provide chilled beef for the Lon-

*See the National Geographic Society's new map of The Pacific with this issue of THE NATIONAL GEOGRAPHIC MAGAZINE.



© The Argus

HEADDRESSES BOB AS PAINTED FIGURES PERFORM THE "WILD DUCK" DANCE

A native song and dance festival may continue every evening for two or three weeks (page 737). Performers here wear head ornaments of grass and feathers as tall as barber poles, and have designs painted on their skin. Costumes and songs vary in the different symbolic corroborees.

don market or bully beef for British Tommies or jack-tars.

Bawling, clashing horns, and kicking up great billowing columns of dust in their wake, these armies may be several months on the march (page 726). The drovers, a carefree cheerful band, swing along on horseback singing, whistling, and eating the grime. At night camp they take turns riding around their resting beasts to prevent possible stampedes.

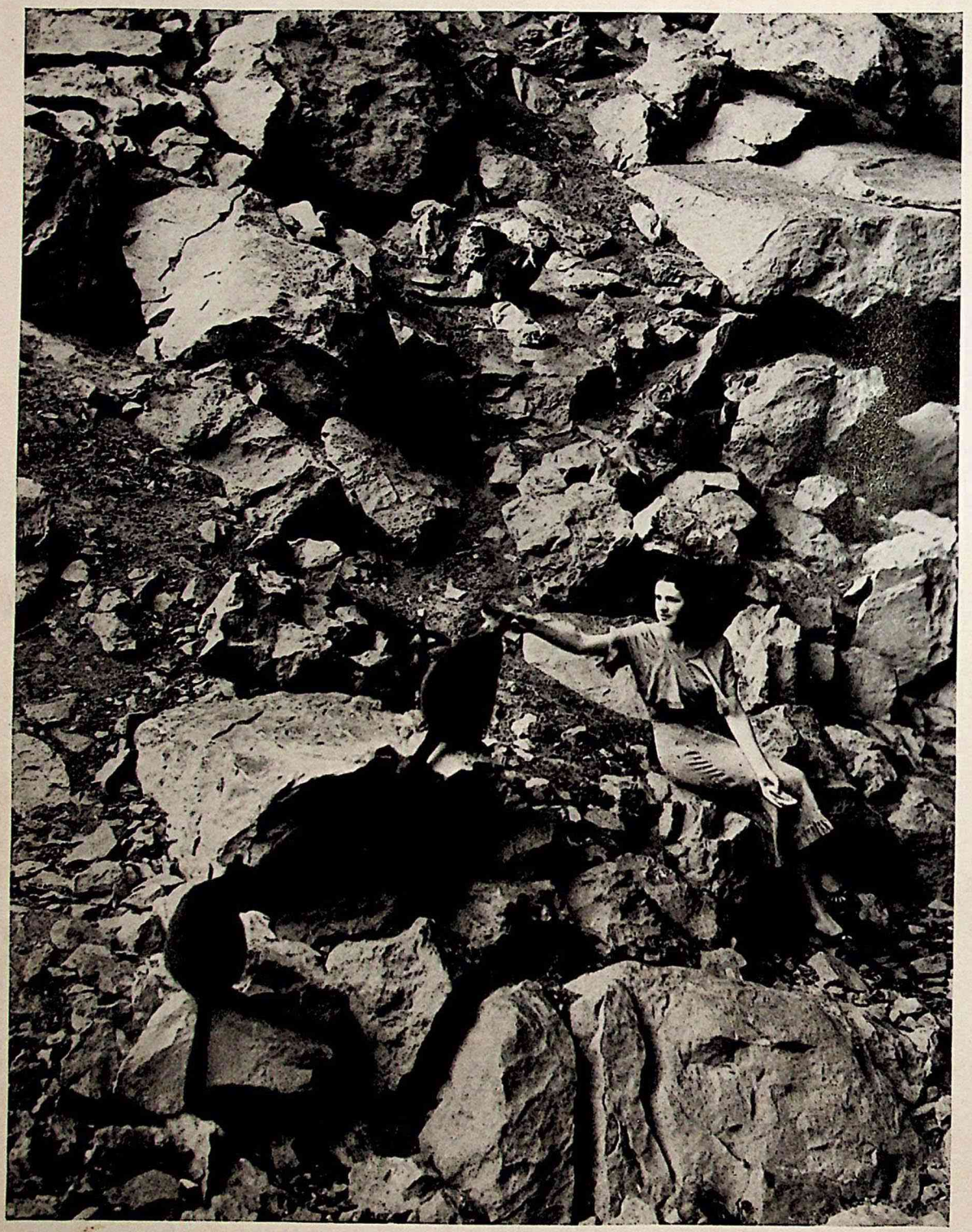
Not all of the herds are sent direct to market from the interior. Many are fattened on the better pasture lands near the coasts, where they can be sold quickly when the market is favorable. "Cattle farmers" Australians call the men who make a business of conditioning stock in this manner.

Unlike Argentina, where wild herds once roamed and men needed only to round them up, the Australian cattle industry has been built up gradually from small beginnings of half a century ago. Frozen-meat contracts have provided the impetus.

In recent years, however, Australia has seen new handwriting on her economic wall. With improved refrigeration facilities and fast ships, fresh chilled meat has come to England from the Argentine. Against it frozen meat cannot compete.

So the Commonwealth has turned to its scientists to learn whether it, too, can deliver chilled beef to the London market, a distance handicap of 13,000 miles.

In the Brisbane abattoirs I talked with the experts who have tackled the problem. With test tubes and refrigeration chambers, and with bacterial, fungal, and yeast growths under their microscopes, they are learning the conditions necessary



FREE LUNCH TEMPTS SHY ROCK WALLABIES—TRY TO FIND THEM!

Their dull-brown coats almost blend with the surroundings. Like their larger cousins of the kangaroo family, these animals are marsupials (page 737). They are remarkably agile among rocks, and when frightened bound away on their hind legs. Normally they leave their homes in crevices only at night to feed, and thus are seldom seen; but these inhabitants of the hills about Jenolan Caves (Plate I) have become fairly tame.

for meat to maintain its full freshness and color during the month-and-a-half that it must be on the high seas.

Romance is in their refrigerators, which are controlled to fractions of a degree, and their pipettes reflect future profits, because these quiet workers have been remarkably successful in their experiments.

Several trial shiploads of meat, sent in 1934, arrived in London without deterioration. When I was at the laboratories, the announcement came that another shipment had just reached its destination in perfect condition, even though a soupy London fog had caused an unanticipated five-day delay in the Thames.

To these heartening assurances, the operators of various meatworks have quickly reacted; plants are being altered to meet the new requirements.

BUTTER FOR BRITISH TABLES

Less spectacular, perhaps, but doubly more profitable than the herds that roam the interior, is the dairy stock pastured in the fertile coastal belt, mainly in New South Wales, Victoria, and Queensland. Approximately a sixth of the country's cattle are bred for their milk products.

To England, throughout the Far East, and even to Panama is sent the output of the busy churns of the Commonwealth. Years ago, while living in Siam, we used to buy Australian butter. To the tables of the United Kingdom, however, goes the bulk of the 226 million pounds of butter that is shipped abroad each year.

And what of Australia's agriculture? In a few decades it has had remarkable growth. Yet the total acreage now under crop is but little more than the area of Maine.

Stated thus, it seems unimpressive, but in terms of wheat its importance stands out. Today Australia is one of the three leading countries in the export of this grain.

In shape like a gigantic boomerang, vast wheat fields, some 12,000,000 acres in extent, sweep down across the plains from southern Queensland through New South Wales; bending westward in Victoria, they stretch out into South Australia. Another three million acres have recently been brought under cultivation in Western Australia.

Up in the arms of Sydney Harbor grain elevators form Babylonlike towers along the shore. But elevators are rather the exception in Australia; most of the wheat is handled in bags. Along sidings and at lonely tank towns beside the railways and at the South Australian ports sacks of grain are corded up in mountainous piles—sometimes 100,000 to 200,000 bags in one stack—awaiting shipment.

WINDJAMMERS AND STEAMSHIPS CARRY WHEAT

Through the stories of the sailing races written by A. J. Villiers,* GEOGRAPHIC readers are familiar with that portion of the grain shipments which is carried away in the picturesque old windjammers in their dramatic trips around the Horn on their way to England. On these and by prosaic steam transport, more than 150 million bushels of wheat are normally shipped from Australia's shores each year.

Back of these shiploads of grain lie indefatigable toil and no small amount of inventive genius, for Australia has presented many peculiar problems.

A striking example is the Mallee region in South Australia and northwestern Victoria. This territory gained its name from the mallee, a low eucalyptus scrub, which covered the brown soil in such a tangled mass that men could not clear it with axes.

For years these scrublands were looked upon as hopeless wastes. Then someone hitched his oxen to an old boiler filled with rocks and found that he could successfully roll the bush down so that it could be burned. With the aid also of an Australian-invented "stump-jumping" plow, which hopped over many hidden roots and other obstructions left from firing, the land was won to agriculture.

Today, mile after mile of waving grain blankets these former scrub wastes, as large areas of the Mallee have been redeemed by the roller method of clearing.

Through the belt of comparatively low rainfall, reaching in places to the very edge of the desert, vast districts have also been converted into profitable wheat lands by dry farming.

Here, with eight, ten, and twelve-horse teams on plows and harrows and with abundant energy and hope, the farmers fallow their field for a period of a year, in some places fifteen months, to conserve sufficient

* See "Cape Horn Grain-Ship Race," NATIONAL GEOGRAPHIC MAGAZINE, January, 1933, and "Rounding the Horn in a Windjammer," February, 1931.

moisture in the soil to produce their crops. After each rain between plowing and planting, the land is harrowed to maintain a surface mulch that will check all possible evaporation.

ONE MACHINE TRANSFERS GRAIN FROM STEM TO SACK

Lacking sufficient laborers, the Australian farmers early turned to harvesting machinery that could be operated by few hands (page 724).

In 1843 John Ridley produced a "locomotive thresher," or "stripper," which would harvest the grain from the standing straw and discharge it ready to be winnowed, thus revolutionizing the industry.

Later (in 1884), Hugh Victor McKay, then a lad of nineteen, created from parts of old farm implements and many kerosene tins a machine that he called a "combined harvester."

When farmers smiled and took no interest in his claim that it would strip, thresh, and winnow the grain all in one operation, McKay got on his bicycle and toured Victoria, seeking to overcome their skepticism and conservatism.

Today, the busy factories of the Sunshine Harvester Works, near Melbourne, are the outcome of McKay's inventive genius, first demonstrated in that contraption of iron and tin. In countless fields these harvesters voice a steady rhythm as they transfer the grain from stem to sack.

In addition to wheat, Australia grows in varied quantities nearly every crop that thrives in temperate and tropical climates.

Fruitgrowing has claimed considerable attention. On tables of the Commonwealth appear an abundance of fruits in season: bananas, pineapples, pawpaws, and mangoes from Queensland; apples from Tasmania and Western Australia; oranges mainly from New South Wales and the Murray Valley; and stone fruits from several States. And there is wine. South Australia's vineyards produce four-fifths of the 16 million gallons that are made annually.

Besides supplying local needs, an export trade has also been built up in fresh and dried fruits, jams, jellies, and wine.

To see one of the Commonwealth's thriving crops you must travel far north into Queensland. By the time you have reached Townsville or Cairns, your shirt is clinging to your back and your collar feels like a wet towel around your neck. For here is the heat of the Tropics, steamy and oppressive.

In these regions the Queenslanders are growing sugar cane. This industry, however, is more than the mere supplying of upwards of four or five million tons of cane annually to the mills that squeeze out 29 million dollars' worth of sugar. It is the testing ground of a national ideal.

Australia's cane fields are like those in other parts of the world, but with this difference: white laborers, not brown, are working them. Stripped often to the waist, these bronzed workers are demonstrating that white men not only can live but can produce effectively in the Tropics.

Previous to the federation of the States in 1901, Kanakas were employed to till the land and cut the cane. Their presence, however, was counter to the national principle of a "white Australia."

With sweeping changes, brought about by government guarantee, Queensland repatriated the Kanakas, and white laborers shouldered the task. It is hot work in the fields, but they are a healthy lot and efficiency is their pride. In addition to supplying the country's needs, nearly a third of the output of the mills is normally shipped to foreign marts.

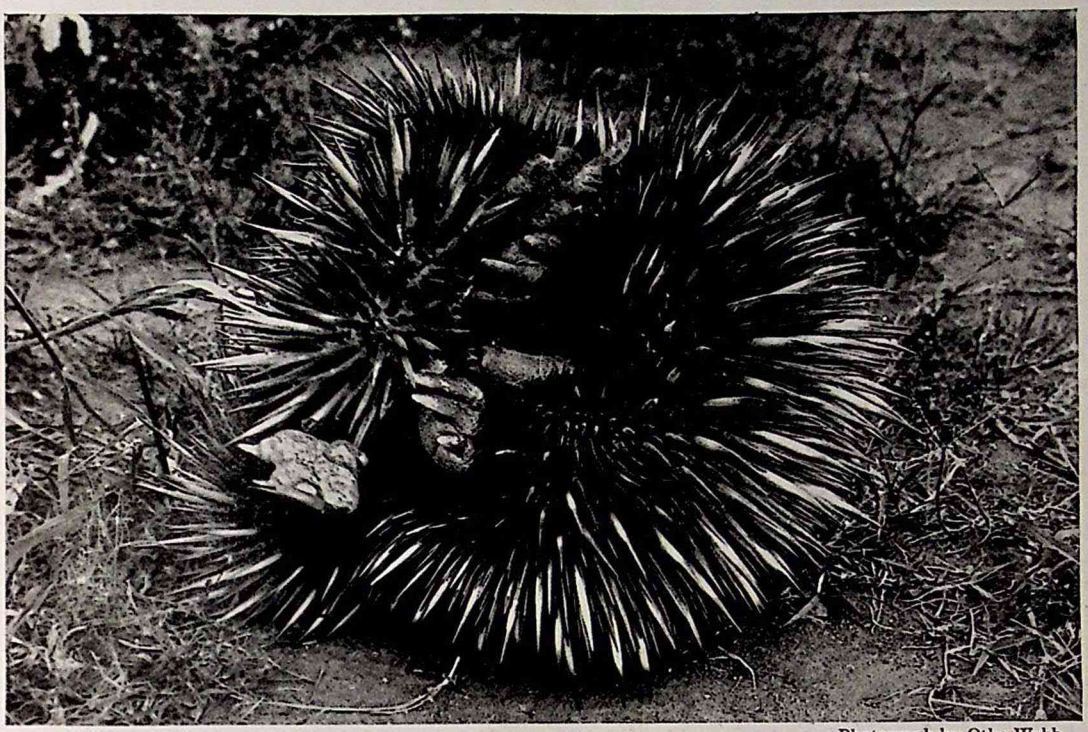
FORTUNES STAKED ON RAINFALL

In appraising Australia's economic strength, one has also to consider her weaknesses. Here, as in the land of the Pharaohs, lean years may follow the fat. And for the same reason—lack of water. The fortune of the outback pastoralist, and in some cases the wheat grower, is staked on rainfall.

I have heard of women growing hysterical and weeping with joy when a long-prayed-for rain began beating a welcome tattoo on corrugated iron roofs. Silently, with bared and bowed heads, men have stood out in their fields as breaking storms have brought salvation to withering crops.

Since 1880 there have been 14 droughts. Most of them, however, were confined largely to the interior. But not all. Climaxing a five-year period of unfavorable circumstances, the great drought of 1902-3 spread like a scourge from one end of the continent to the other.

In a single year 15,000,000 sheep and more than a million cattle died of starvation and thirst; but during the whole stricken period nearly four times that num-



Photograph by Otho Webb

WHEN AN ECHIDNA CURLS UP TO SLEEP, IT ERECTS ITS OWN "BARBED WIRE"

Assailants are discouraged by the sharp, black-tipped yellow spines. This "native porcupine," or "spiny anteater," is one of the most primitive mammals and belongs to the same order as the platypus. It produces a single egg, which is deposited in its pouch; there the young is hatched and suckled until it is nearly one-third the size of the mother.

ber had perished. The wheat crop fell to less than a third of its normal production. And many people left the country. Fortunately, such devastating droughts are rare.

While man cannot remake a continent, he can improve its conditions. And the Australians are doing so. In the Murray basin in southern New South Wales, Victoria, and the edge of South Australia, engineers are working on a huge water conservation scheme (p. 735). With the Burrinjuck (once known as Barren Jack) and Hume Dams and their allied weirs, tens of thousands of acres are being assured dependable water supplies. Smaller projects likewise have brought vigor to thirsty soil.

THE BOON OF ARTESIAN BASINS

Man, beast, and soil, too, are supplied by water through miles of open channels and pipe reticulation in northwest Victoria and in South Australia.

Fortunate the day when an Australian drilled down into the earth and water poured forth. For here was tapped an artesian basin, a source of water that has since meant millions of dollars to the Commonwealth's pastoral industry.

It required the parched period of a drought, however, for the country to test fully the possibilities of this underground supply. In 1885 the Queensland Government sunk a bore to the depth of more than 1,600 feet, and from it gushed 291,000 gallons of water in a day!

Today, more than 6,400 artesian and subartesian bores have been exploited to provide water supplies. Most of it is impregnated to a greater or less degree with mineral salts, rendering it unsuitable for irrigation or domestic uses, but in most cases it is suitable for stock to drink.

Australia has nine known artesian basins. Remarkable is the Great Artesian Basin, which underlies much more than a half of Queensland and extends out into Northern Territory, South Australia, and New South Wales—covering 600,000 square miles!

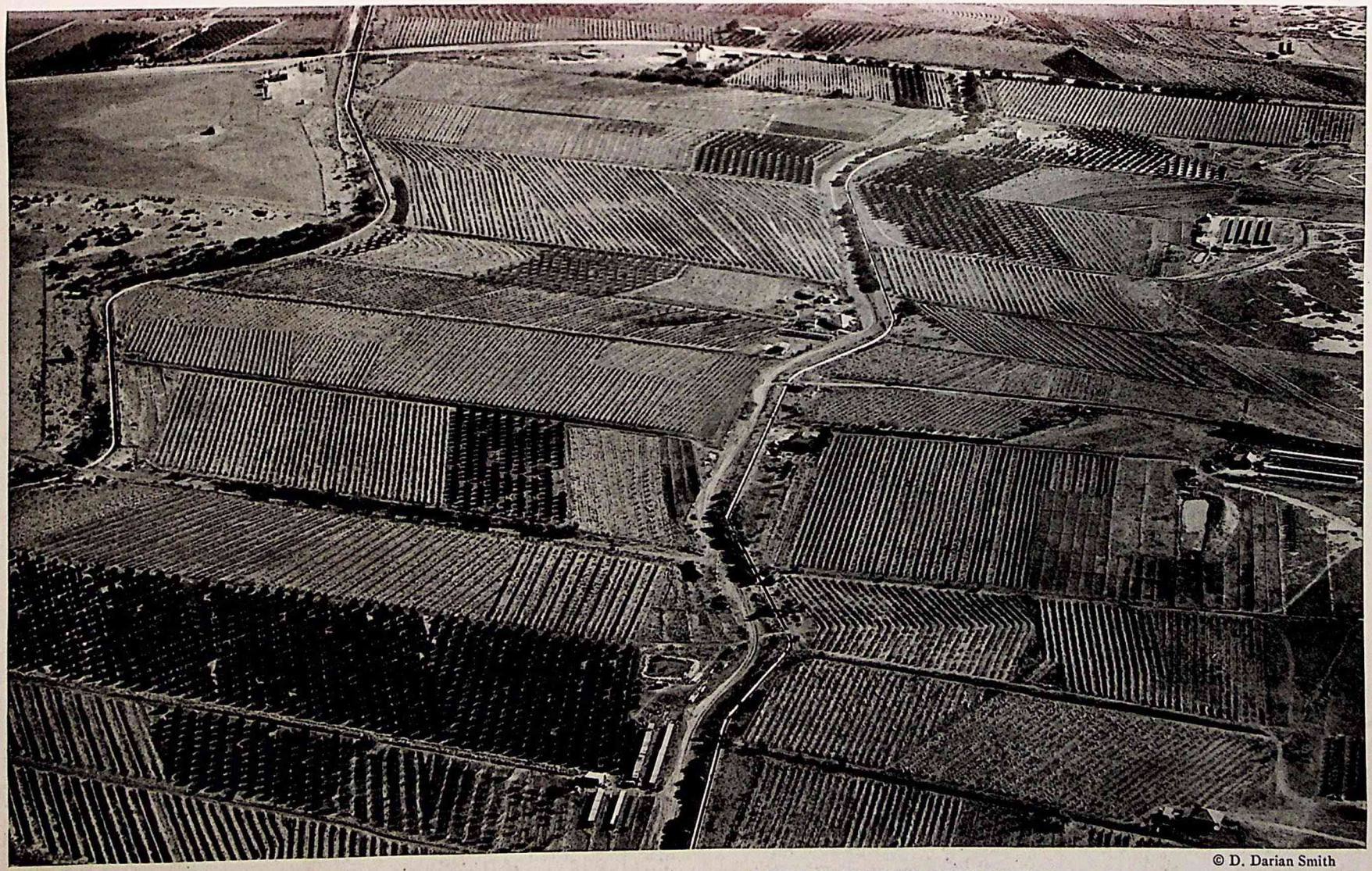
THE PLAGUE OF RABBITS

When Mrs. O'Leary's legendary cow kicked over the lamp that set Chicago in



DRIVES AND TRAILS THREAD THE FORESTS AND FERN-BANKED GULLIES OF THE DANDENONG MOUNTAINS

Giant eucalypts tower nearly 300 feet above the thick foliage of tree ferns in these highlands near Melbourne. In winter, vacationists skate and ski in Victoria's evergreen mountains. Here, in more secluded places, live the lyrebirds (page 747).



© D. Darian Smith

A CRAZY QUILT OF IRRIGATED FRUIT FARMS BLANKETS MURRAY RIVER VALLEY

An extensive locking system installed on the river provides a regulated water supply for wide areas (page 733). Fruits for city tables, also milk, butter, and cheese, are produced in these irrigated regions. Average annual rainfall in well-defined belts dictated whether men should farm, raise cattle, or herd sheep, until human ingenuity and heavy expenditures created such oases.



Photograph by Otho Webb

THE BEARDED LIZARD LOOKS AS IF THE CANDID CAMERA HAD CAUGHT A CROONER BEFORE THE MICROPHONE

The animal merits its nickname because of the bristles on its lower jaw. It strikes this ferocious attitude to protect its young. When at bay, the spiny reptile, *Amphibolurus barbatus*, distends the tissues around its throat into a rufflike "scare organ." More than 200 large and small species of lizards are found in Australia (page 738).

flames, the resultant disaster was less far-reaching than when another fire about that same time burned up the fence that enclosed a rabbit warren at Castlemaine, Victoria. The rabbits overran the country.

Not all of the countless millions of rabbits that have bred to ravage the continent came from this one source. Some arrived with the first settlers in Sydney. Others were left on islands and the mainland by crews of sailing ships to provide food.

Shortly after their introduction into Victoria, a man was fined £10 in the Colac police court because he shot one rabbit belonging to John Robertson. Within a few years Robertson himself spent £5,000 trying to exterminate them!

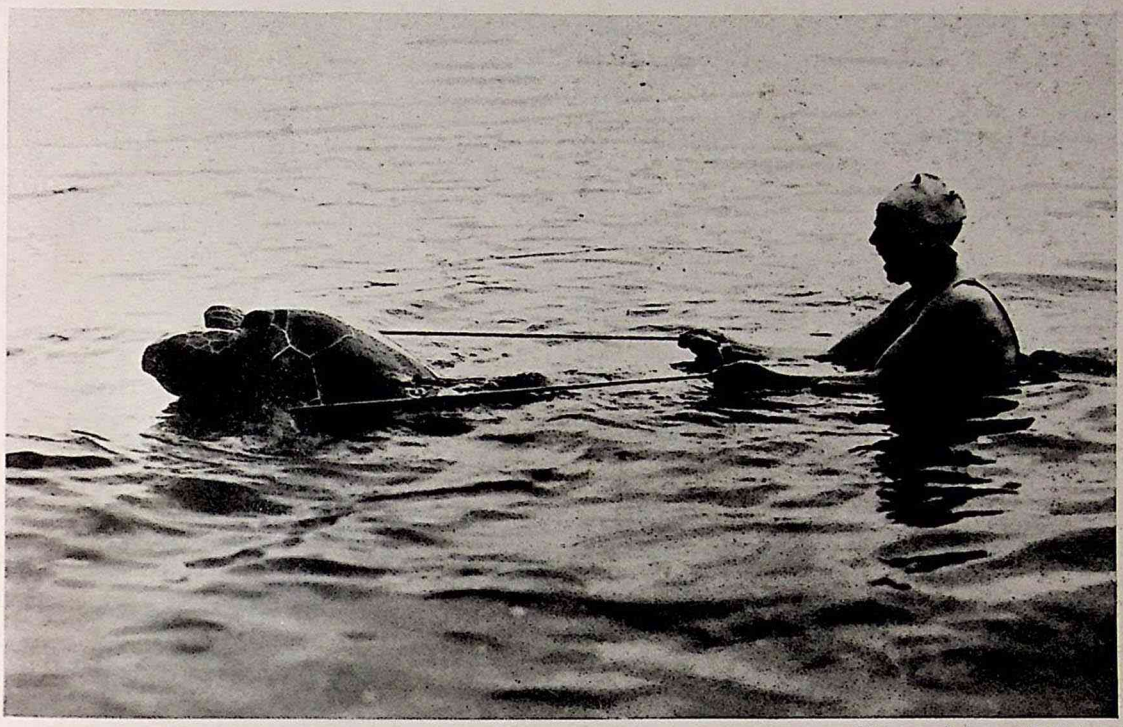
A FENCE 1,100 MILES LONG

Prodigious in their increase, the pests have covered most of Australia, causing tremendous havoc. During droughts millions of carcasses have been found beside dried-up water holes and streams. But with the coming of rains they have reappeared as badly as ever.

With fencing, netting, poisoning, fumigating, trapping, and digging out, staggering amounts of money have been spent by the Government and private individuals, and yet the rabbit menace has not been stamped out. Not tons, but shiploads of wire fencing have been strung across the country. In Western Australia one fence alone is 1,100 miles long, extending north and south all the way across the continent!

Inestimable, too, have been the losses to the Commonwealth, because of the deterioration of pastures. It is asserted that if all the rodents were removed, the capacity of the land for livestock would be increased 25 percent!

In recent years some of these vermin have been converted into profit through the frozen meat and skins sent abroad. But as a friend in the Sydney Exchange remarked to me one day: "For the untold millions of pounds that rabbits have cost us, we've had only a million a year in return."



Photograph from A.N.T.A.

RIDING A GREEN TURTLE IS FUN IF YOU KEEP ITS HEAD UP

An agile person may even straddle its back in shallow water; but on reaching a deeper place, the turtle suddenly takes control by diving and forcing the rider to come up for air. These large edible reptiles are plentiful along the coast of Queensland.

Another pest that has spread rapidly in Queensland is the prickly pear. With the aid, however, of cochineal insects and pyralid moths, its spread is being checked.

From people who live in this area I learned that thousands of acres are now being utilized, which a few years ago were so densely covered with the pear that one could not ride through on a horse.

Dingoes, or wild dogs, which, before settlers came, lived on birds and such other prey as they could find, later turned to a diet of rabbits. Eventually they began to attack sheep. Increasing in numbers, they moved eastward into the sheep districts and became a serious menace.

West of the Darling their depredations were so bad in earlier years that many station owners were forced to substitute cattle for sheep on their pasture lands.

As in the combat against rabbits, constant warfare has in past years been maintained by means of fences and poisons to check their activities.

Bounty is also paid for their scalps. When I was in Queensland, the price was about a dollar, but before their numbers began to decrease it was sometimes several times that amount.

THE LAND THAT TIME FORGOT

Until 1788, when white settlers made their first permanent encampment beside Sydney Harbor, from which has grown the energetic Commonwealth of today, Australia was a land that time had forgotten. In many respects, it was like a museum in which the specimens of the ancient past were not dead and card-indexed, but living.

Here "Stone Age" black men roamed, living by the skill of their spears, stone implements, boomerangs, and their knowledge of edible fruits and roots. Weird corroborees were their entertainment (page 729).

Perhaps 60,000 still wander in the outback, living as they have through countless ages. A few are employed on cattle and sheep stations. But they are a vanishing people; already the last of the primitive inhabitants of Tasmania has become a museum specimen.

The animals and birds, like the people, are living remnants of a bygone age. Here are kangaroos of many kinds, including

wallabies; also lovable koala bears, strange moles, wombats, Tasmanian devils, striped Tasmanian wolves, bandicoots, pouched mice, and native spotted cats—all marsupials (Plate III and pages 708, 730).

Here, too, is found that primitive link between mammals and fowls—the shy, water-loving platypus. When the first specimen arrived in Europe zoologists cried "Fake," for the strange creature possessed a duck's bill, furred body, and webbed feet.

Among its peculiarities, too, is the fact that it lays eggs, but suckles its young.

On the plains wander five-feet high emus, flightless now, for through the ages their wings have degenerated. Little wonder that the Australians have chosen this remarkable bird to appear with the equally remarkable and distinctive kangaroo on their national coat of arms!

In forest and bush are birds of gay plumage, sweet song, and eccentric habits. Among them are unique bowerbirds that build fancy halls of sticks, decorated with colored berries, bones, shells, and tufts of moss. In these they bow and dance and play, the males performing like ancient courtiers before their mates.

COCKATOOS AND KOOKABURRAS

Cockatoos are as familiar as crows in the Middle West (page 723). The lyrebird, famous for the beautiful lyre-shaped tail of the male, mimics any sound from the musical note of the bellbird to the noise of a buzz saw (page 747).

But of all Australia's birds none is more remembered than the kookaburra, which fills the bush with its idiotic peals of laughter. The mocking, hilarious outbursts of this stubby, silly-looking bird have won for him the name of "laughing jackass."

Weird-looking lizards and different kinds of snakes also inhabit this biological backwater (page 736). In the ground of the Gippsland district of Victoria, too, are some of the world's largest earthworms. Megascolides, scientists call these worms that make gurgling sounds as they propel themselves through their lubricated burrows. Imagine trying to use one of them to bait your fish hook, for they grow from 4 to 6 feet in length, and some reach 9 and 11 feet!

To the long list of things peculiar alone to Australia must be added thousands of species of plants and trees. They, too, are of ancient lineage. More than 300 species of eucalyptus trees and two-thirds of the world's acacias are indigenous to the continent (page 734).

Everywhere the eucalypts dominate, and the forests are indeed an impressive sight. Some of these mighty gums are among the world's tallest trees, rivaling the sequoias. In the karri forests of Western Australia I saw men timbering among trees whose massive grey boles reared skyward to the height of 180 feet or more before they put out a branch.

In the Dandenong Range, near Melbourne, are other monarchs whose columns cause one to visualize them as belonging to some mighty cathedral (Plate V).

Lacking a satisfactory classification for the profusion of eucalypts, most people despair of calling them anything except "gums." Some, however, are distinguished by their color or by the peculiarity of their barks, which they shed regularly, though they do not lose their leaves. Thus one hears of red gums, blue gums, white gums, spotted gums, and cabbage gums; or of stringybarks, ironbarks, woollybutts, scalybarks, and smooth-barks.

Almost exclusively hardwoods, many of the trees provide timber of great strength and durability. Railroad sleepers of ironbark have a life of 25 or 30 years; girders from this wood, too, are remarkably resistant to fire.

Such a wood also is the jarrah, one of the two best known timber trees of Western Australia. In addition to being unusually durable, it is free from the ravages of white ants (termites) and marine borers. Western Australia's other timber tree is the karri, which may grow to a height of 300 feet. It flourishes in a 200,000-acre area in the southwest corner of the State.

From the lush forests of Queensland come beautifully grained woods of special value in the manufacture of furniture.

To see the beauty of many of Australia's woods, one need only walk through Parliament House in the new Federal Capital at Canberra, for here have been utilized a number of varieties of the country's choicest timber.

As with most pioneering peoples, the Australians have slashed down valuable forests to provide spaces for fields, orchards, and grazing lands. One of the most desolate sights to me was to see vast areas of once-beautiful forests ringbarked (girdled) and left standing, the dry white columns reminding one of some colossal cemetery.

Conservation and afforestation are now receiving greater attention.

In addition to their value as timber, various eucalypts have been utilized to some degree for their oils ever since a pioneer doctor found that essential oils extracted from the leaves were good for colicky complaints.

AUSTRALIA'S GOLD RUSH

In 1910, while experimenting at Broken Hill mines, Henry Lavers found that the addition of eucalyptus oil to finely ground minerals facilitated the separation of the metallic sulphides from the gangue in the flotation process. Since then, the trees have had increased use in Australia's important mining industry.



Photograph by Otho Webb

"FLYING FOXES" SLEEP UPSIDE DOWN

By day these gray-headed fruit bats hang in trees, but at night they raid orchards to eat peaches, plums, pears, and other soft crops. Much ripe fruit is damaged and knocked off by the marauders, which sometimes travel in huge flocks.

Mining! Here is yet another of the continent's many romances. As gold opened the American West, so also its discovery began a new era for Australia.

When news of the gold rush of '49 reached Sydney, Australians flocked to San Francisco. Among them was Edward Hargraves. When he saw the gold-bearing rock of California, he was struck by its resemblance to some of the rocks in his own land. So back he went; and in 1851 turned the country topsy-turvy with his discovery of gold in New South Wales.

Here, as in California, there was a frenzied stampede. And men began prospecting far and wide for other possible deposits. Nor was the excitement unfounded. In quick succession yellow magic was unearthed in Victoria at Ballarat, Bendigo, and Castlemaine.

Public service was threatened with complete disruption. Farms, shops, and ships were deserted. For what able-bodied person was willing to remain at some ordinary job while others were panning $100 to $200 a day and finding nuggets of incredible size, worth thousands of dollars?

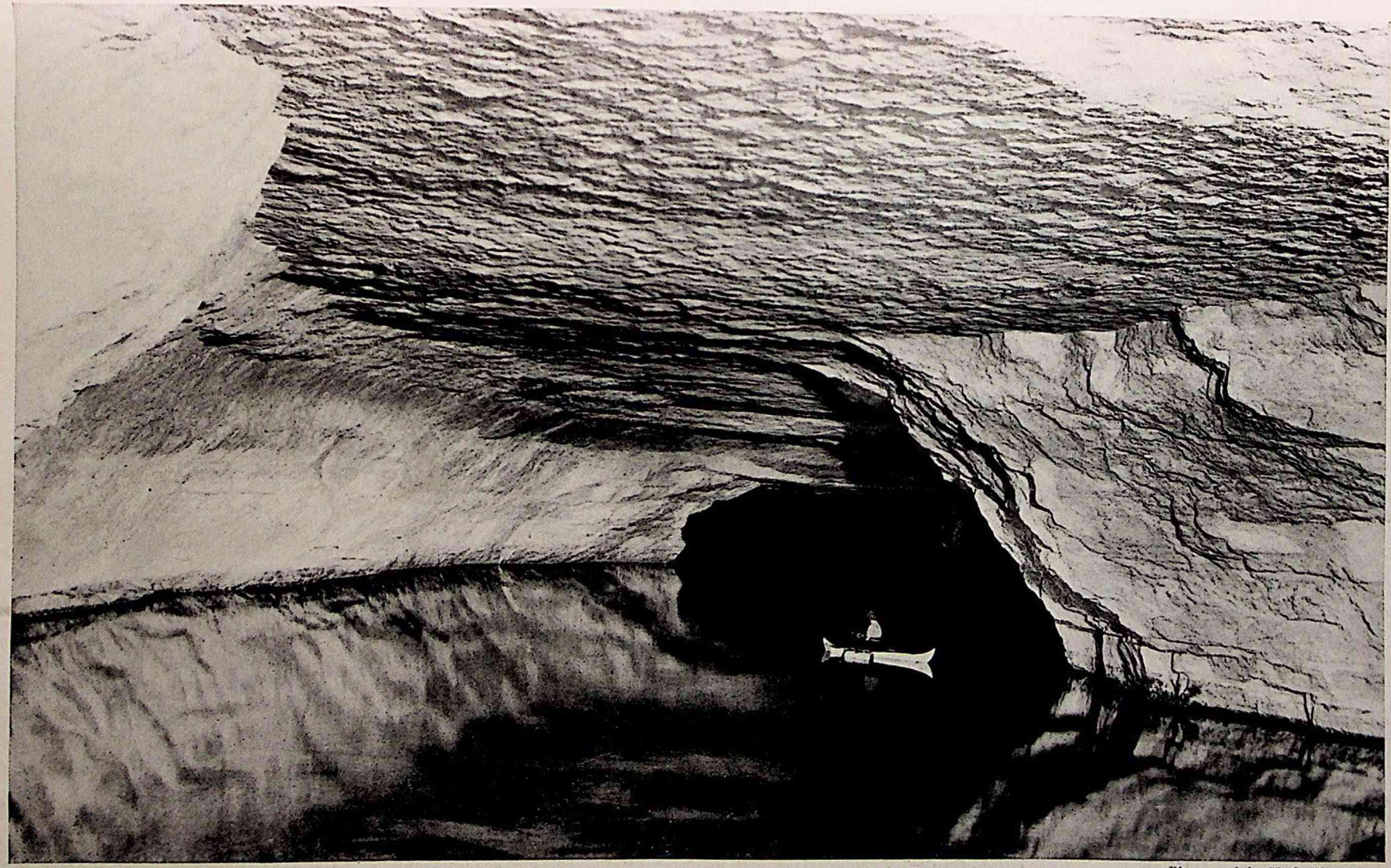
No part of the world has been so prolific in large individual finds as the Victoria



Photograph from N.S.W. Government Printer

STORM GODS GATHER ON THE LOW ROOF OF THE CONTINENT

Mount Kosciusko, loftiest peak in Australia, is only 7,330 feet high, and snow stays on it only part of the year. Below the Equator, Whittier's "Snow-Bound" would have to read, "The sun that brief August day." Lacking an extensive high mountain system to halt moisture-laden clouds or to provide snow fields, the country is irregularly watered and is partly arid desert land.



Photograph by H. G. Watson

NATURE BUILT SUBWAYS FOR CANOES 300 FEET BENEATH NULLARBOR PLAIN

Dissolving the limestone of the treeless, streamless plateau, rainwater sinks into a network of subterranean caverns and channels. To reach this lake near Eucla, Western Australia, the photographer's party carried their canoe 1,500 feet along a sloping gallery. A former explorer was at first driven out by a pocket of foul air, but returned next day to find the atmosphere purified. So clear is the still, deep water that every pebble on the bottom is visible by lamplight.

fields. Twelve nuggets of more than 1,000 ounces each were unearthed there. The famous Ballarat nugget, the "Welcome," was 2,217 ounces. The "Welcome Stranger" was even larger, and was worth more than $50,000. Greatest of all Australia's nuggets, however, was the "Holtermann," found in New South Wales, which weighed 630 pounds!

In 1850 Australia had a population of only 406,356 people; within nine years it had grown to more than a million! Melbourne in that time grew from a tiny town on the banks of the Yarra into a metropolis of the Southern Hemisphere.

Nor did the gold discoveries end with New South Wales and Victoria. One by one fields were developed in Queensland. Not until 1882, however, did miners find that old Mount Morgan, almost at Rockhampton's back door, was "a mountain of copper capped with gold." Among the stories that cluster around this mine, which has yielded fabulous returns, is that it was originally purchased from a grazier for about five dollars!

Western Australia, last to unlock her wealth, turned out to be a Croesus. Coolgardie and Kalgoorlie became famous throughout the mining world.

What changes came to the sparsely populated State when Bayley and Ford camped by chance at a native well at Coolgardie! There they picked up a little nugget that led to their collecting $300 worth of gold between breakfast and lunch, then later to stumbling onto the fabulous reef that paid out millions!

DISCOVERY OF THE "GOLDEN MILE"

Loss of their horses caused two miners, Flannigan and Hannan, temporarily to take their eyes off far horizons for a little time one June day in 1893, and thus came the discovery of the famous "Golden Mile" of Kalgoorlie, where they had camped two days waiting for water teams.

While most of the prodigious bulk of gold of earlier years was won by pick and shovel from surface workings, the main yields today are from deep shafts and the treating of poorer-grade ores.

In the Bendigo district shafts have been sunk to more than 4,600 feet. In Kalgoorlie I saw men gouging out the rocks with explosives and air drills at the 3,850-foot level.

A few years ago Australia's gold mines were in serious decline, but with the recent soaring prices many are taking a new lease on life. In 1934 the gold yield, because of increased prices, was valued at nearly half the amount that was produced in 1903, when production reached the record amount of 3,830,000 ounces.

With renewed energy "swagmen" are again wandering over sun-scorched wastes, prospecting for new El Dorados. Kalgoorlie is again showing renewed prosperity, although on a much more ordered scale than in the good old days when the unsavory "Devil's Acre" supported 15 "pubs." For there is still much gold in the old Golden Mile, especially at the present premium gold commands in world markets.

Along with the new ore that is being brought to the surface, the mines are also re-treating the dumps that are heaped in mountainous piles from the early roasting methods, as improved flotation processes redeem sufficient quantities of gold to make the operation profitable. Every waste, however, has to be reduced to the minimum.

"We're trapping more and more of the gold carried off with the sulphur fumes," said one engineer as we looked up at the pungent haze that drifted away from the stack of one of the mines. "But even with our present condensers, about 400 dollars' worth unfortunately goes up the flue every day!"

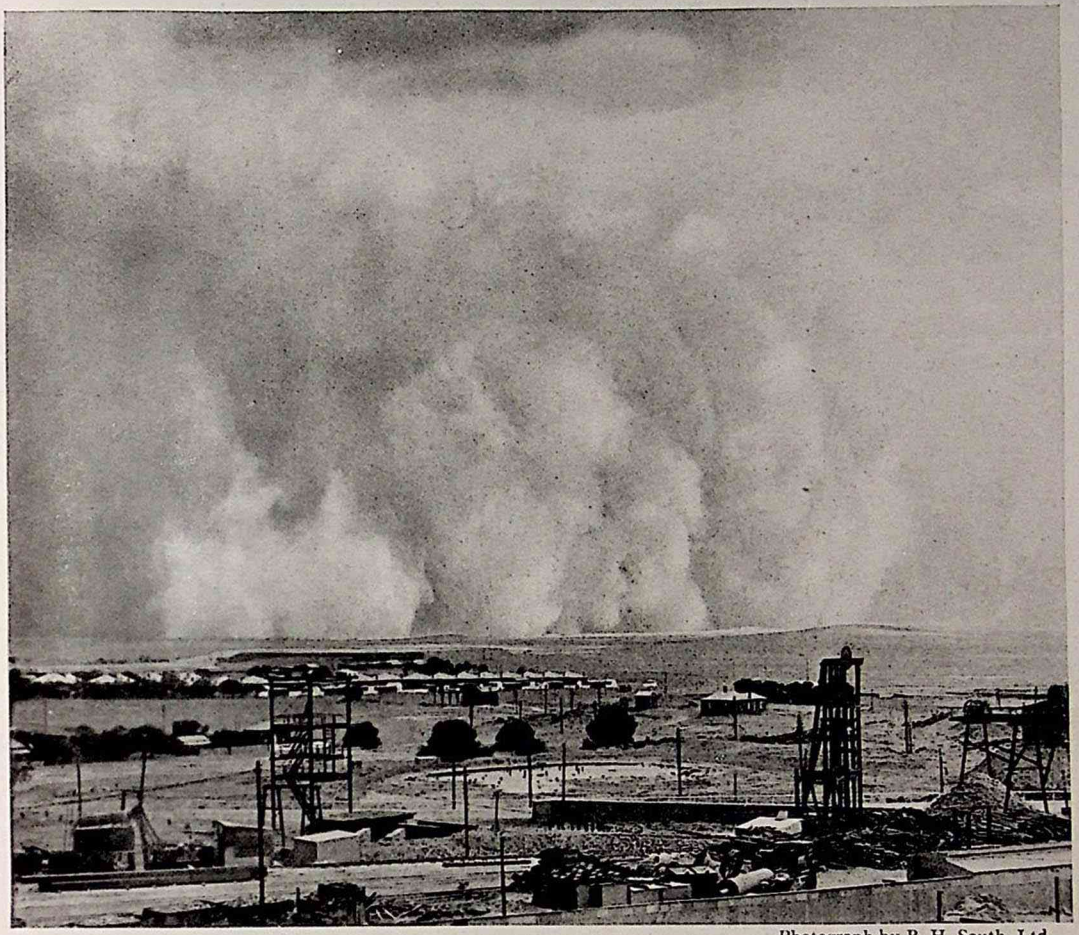
How different is the present Kalgoorlie from what it was when "Paddy" Hannan chased his horses and picked up gold pebbles from the ground!

For gold has built a town and brought a railway. On one of the main corners is a statue of Paddy sitting on a rock with his pick by his side and a canteen in his hand (page 744). His own canteen was often empty, for water in this desert land was scarcer than gold. But turn a valve and water spurts from the bronze replica; its source is more than 300 miles away!

The Mundaring Weir, entrapping water in the mountains near Perth, and the pipe line through which it is pumped by means of eight stations to supply the desert town and mines, is one of the remarkable achievements accomplished in Australia's quest of gold.

Of necessity, mines use it with great economy, as water bills run high.

"In the wintertime we recover about 50 or 55 percent of the water from the operations and put it to use again; in the sum-



Photograph by B. H. South, Ltd.

LIKE A MAMMOTH SMOKE SCREEN DUST CLOUDS ADVANCE UPON BROKEN HILL

The rainbow-hued curtains of dirt resemble those that have swept over thirsty western plains of the United States. Broken Hill, in New South Wales, is a wealthy mining area (page 746).

mer it amounts to about 45 percent," explained my engineer guide.

GOLD "A PAIN IN THE ARMS"

I could not leave Kalgoorlie until I had seen a few bars of the precious metal that has enriched the country by 150,848,000 fine ounces of gold, (more than $5,279,680,000 at the present rate of gold) and has been of such importance to its growth. So Alec Fraser, a genial Scotsman who has handled all of the $80,000,000 that has been produced at Great Boulder, Kalgoorlie's richest mine, opened up the storage safe to show me some (page 744).

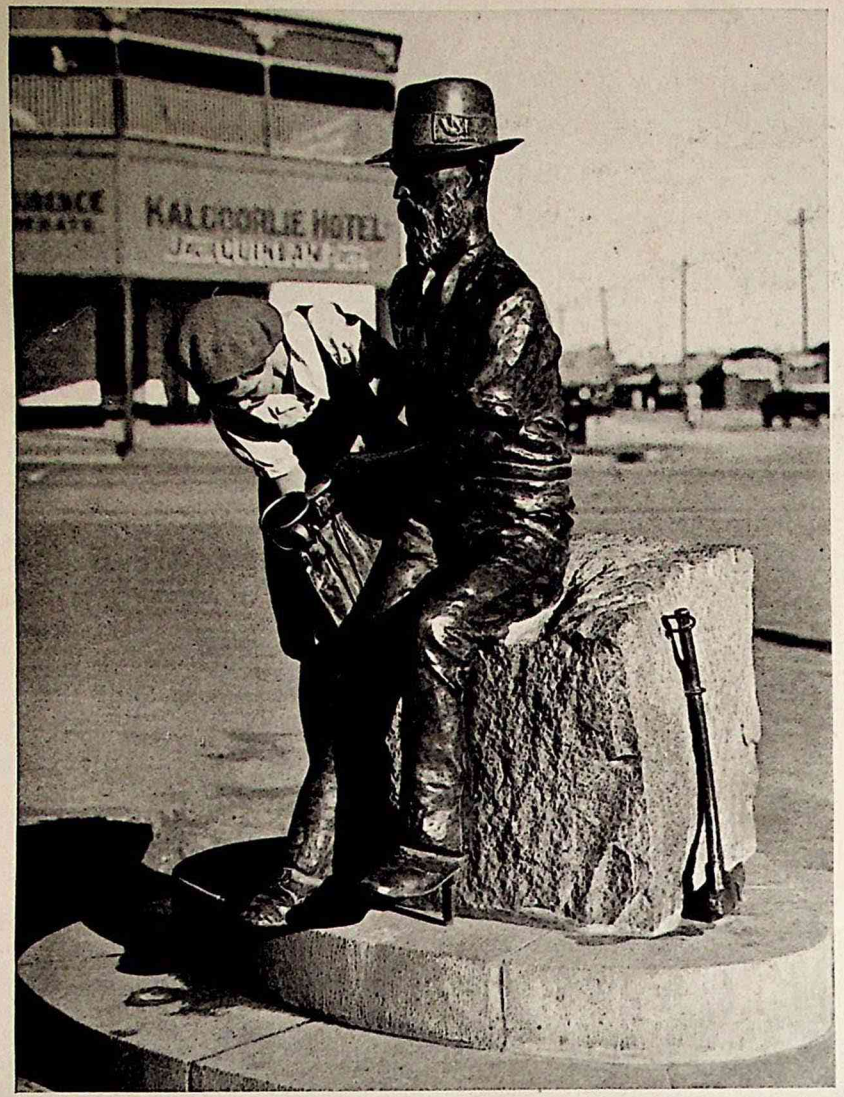
"What have been your thoughts while handling so much gold?" I asked, focusing my camera on him as he held up two brick-sized bars valued at about $30,000.

"If you mean the £17,000,000 that we've produced so far, that's just my routine here. If you mean these two, hurry up and get your picture; they are *heavy!*"

Not all of the mineral wealth of Australia has been in gold. Coal has been consistently mined. The New South Wales coal fields, forming a mighty saucer underlying the Sydney area, constitute the most important coal deposit in the Southern Hemisphere.

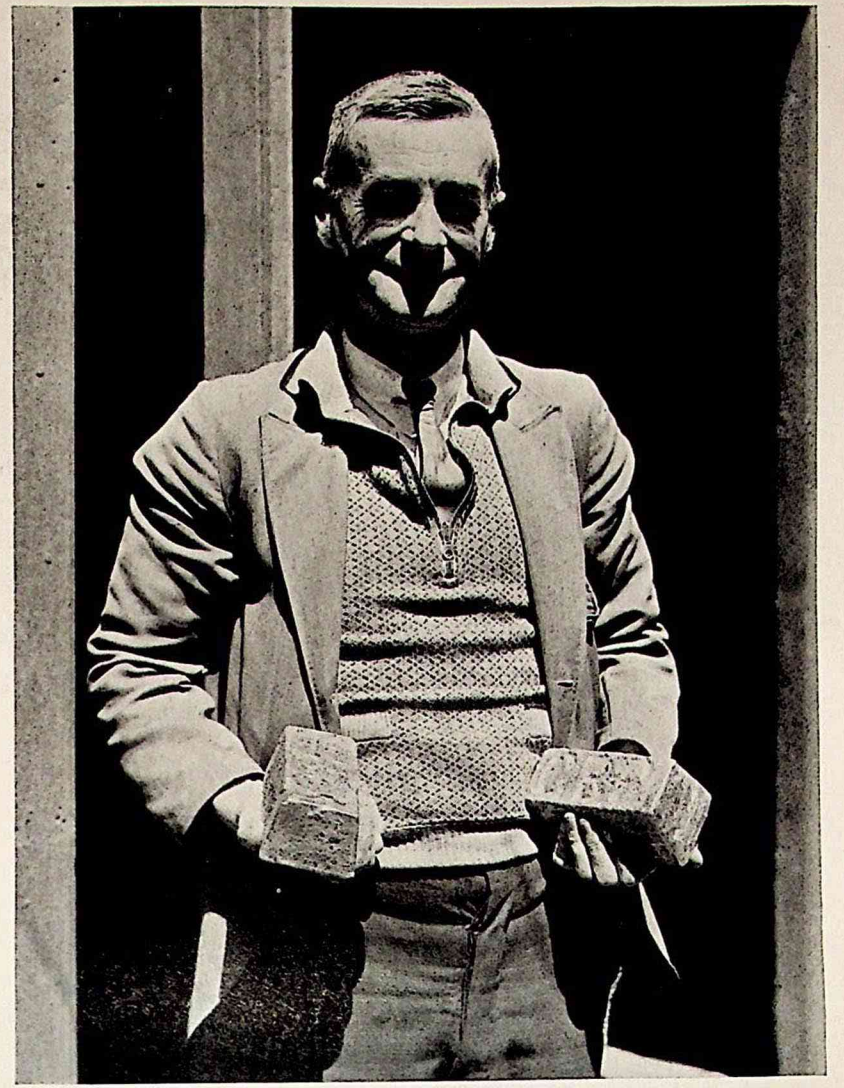
With uptilted edges, outcroppings of this basin come to the surface near Bulli, at Lithgow in the Blue Mountains, and in the region of the steel town of Newcastle. At each of these places extensive mining operations have been developed. The Sydney Harbor Colliery, situated directly above the deepest portion, has sunk its shafts to the depth of 3,000 feet.

Queensland, second richest region in coal, has as yet hardly more than sampled her colossal stores with her mines at Ipswich



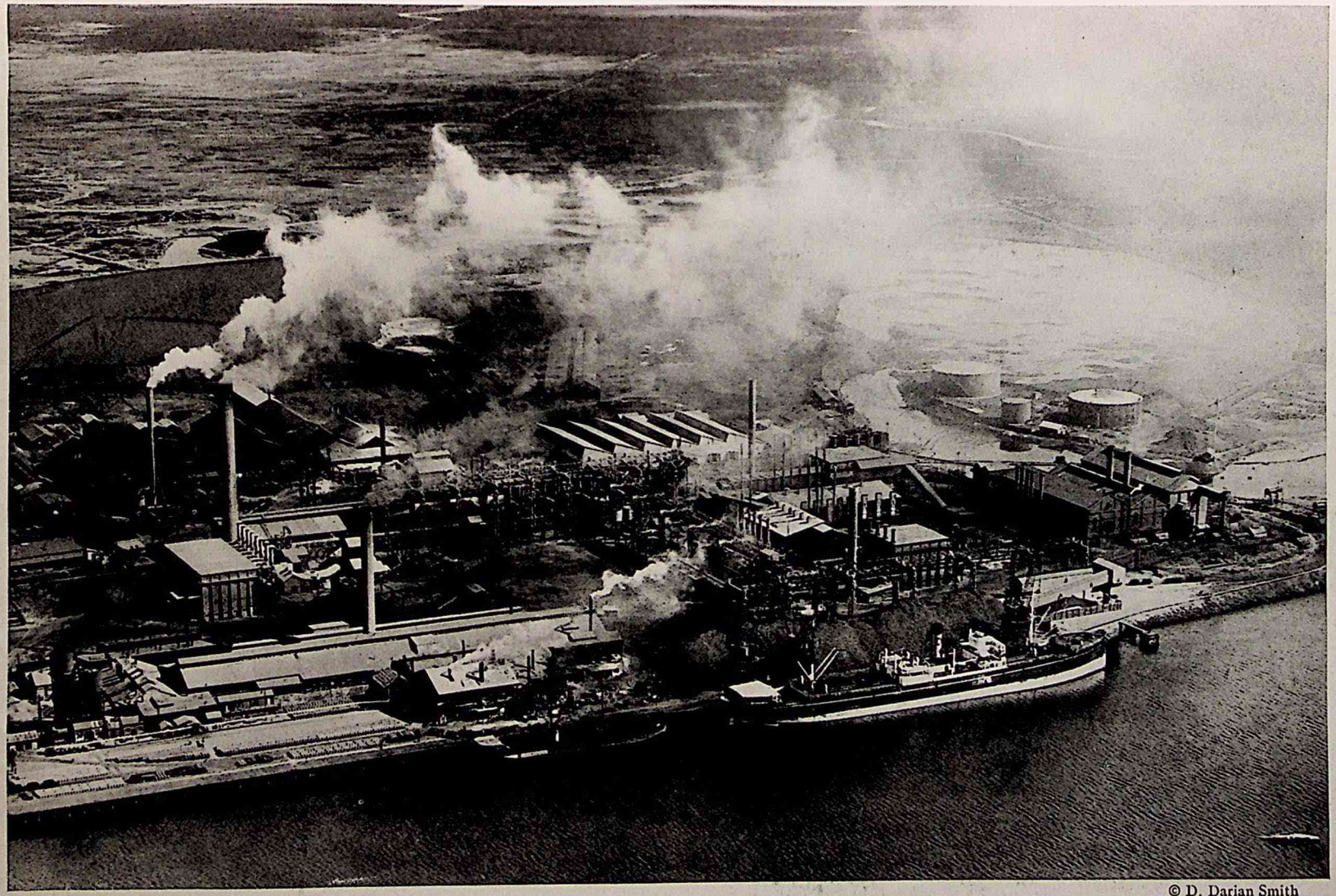
PADDY HANNAN'S CANTEEN IS KALGOORLIE'S DRINKING FOUNTAIN

Because his container was empty, the prospector stopped here in June, 1893, to await water teams. During the halt he and a companion discovered the rich deposits of the "Golden Mile" (page 742).



$30,000 IN GOLD IS ONLY TWO HEAVY HANDFULS

This genial Scot, Alec Fraser, has seen more than $80,000,000 worth of gold come from the Great Boulder Mine, in Kalgoorlie. "No, it's not exciting; it's just something heavy to lug around," was his comment (page 743).



© D. Darian Smith

PUNGENT VAPORS HANG OVER BUSY SMELTERS AT PORT PIRIE

A modern refinery smelts ores brought some 250 miles by rail from the rich lead and silver mines of Broken Hill (page 746). The mineral deposits in neighboring New South Wales have thus proved a boon to this South Australia port, where ships from many countries load metallic cargoes.



Photograph by R. A. Bourne

THEY MIGHT NOT "PLAY HORSE" ON A DUGONG IF THEY KNEW THEY WERE RIDING DOSES OF "COD LIVER OIL"

Such a harpooned sea mammal, fully grown, yields 10 to 12 gallons of oil, used as a substitute for cod liver oil; about 200 pounds of hide for leather; and bones which make charcoal for sugar refining. Aborigines catch dugongs for food, the meat of the young tasting much like that of a suckling pig. The animals browse on the roots of marine plants in the tropical waters off Australia's northern coast.

and along the coast. In the future, however, they may grow to rival the workings in New South Wales. Flying out into the Queensland interior from Rockhampton, I looked down on Blair Athol, where there is an 85-foot coal seam free from any intrusions!

THE "BROWN GOLD" OF VICTORIA

Victoria, lacking an abundance of better coals, has one spectacular deposit of lignite. At Yallourn a vast, yawning hole is gradually growing daily as electric bucket dredges are shaving off the edges of an open cut of brown coal to feed a power plant that supplies most of Victoria's electric power.

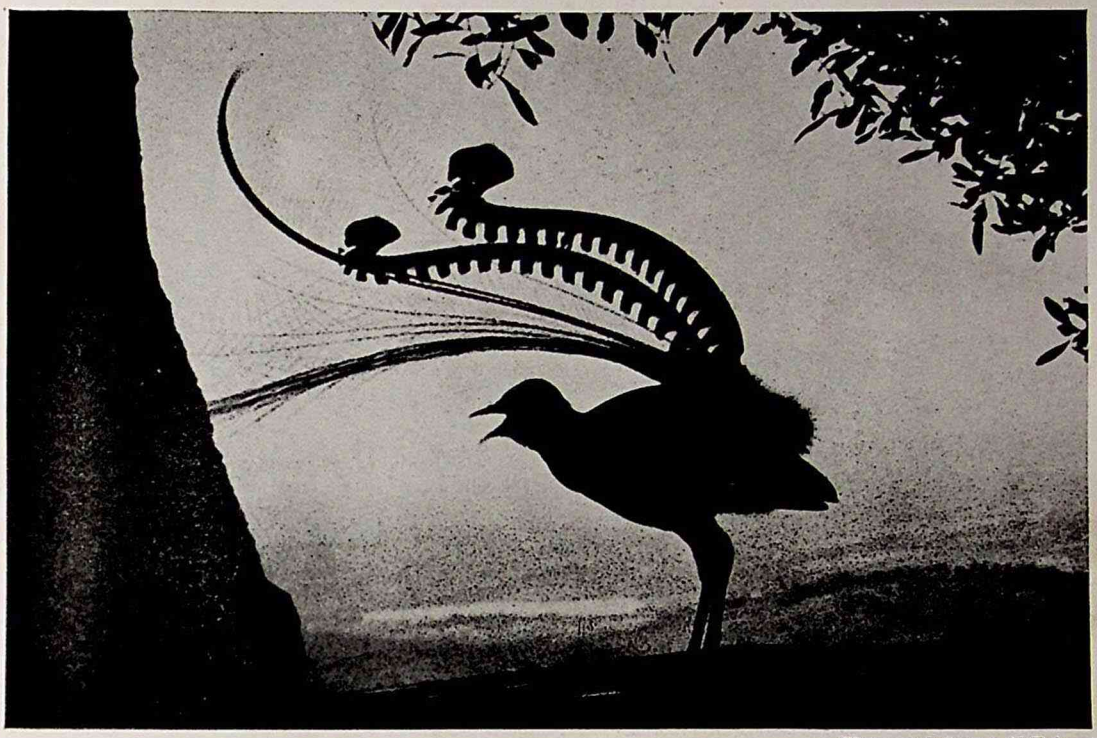
Near by, too, clanking machinery and large presses are turning out countless tons of briquettes for fireplace and factory use. Six billion tons of this brown coal, engineers told me, are in the 180-foot layer that lies just beneath the surface.

Lead, silver, copper, and zinc have likewise played important roles in the Australian pageant of progress. In many ways they are as amazing as the Ballarats and Bendigos, the Coolgardies and Kalgoorlies.

Consider old Broken Hill, out in the mulga scrub on the arid western edge of New South Wales (page 743). Sturt, in his explorations of 1845, called the place desolate and worthless. Yet how untrue. For here appeared an outcropping of iron that was staked out for tin, developed for its silver, and is now worked for lead and zinc!

A prosperous town has blossomed in the scrub, and the whole hill has been beheaded, torn asunder, and burrowed to produce a revenue that is now nearing a sum of ten figures. Its silver-lead concentrates keep busy the smoking smelters of Port Pirie, and its zinc concentrates are shipped off to Europe, Japan, and Risdon, Tasmania (page 745).

Mount Isa, a lonely outpost in far-western Queensland, bustles with activity as



Photograph from A.N.T.A.

A TALENTED SHOW-OFF BROADCASTS HIS ATTRACTIONS

With an audience of one or more hens, the male lyrebird mounts a low pile of earth, spreads his gorgeous lyre-shaped tail, dances, and goes through an amazing repertoire of songs and "impersonations." A superb mimic, he seems to imitate the laugh of the kookaburra, the chatter of parakeets, a locomotive whistle, or the wail of a dingo (wild dog). Lyrebirds inhabit thick forests and fern gullies of southeastern Australia (pages 734, 738).

miners wrest lead, silver, and zinc from the earth.

Copper supplies much revenue to South Australia, compensating that State for its lack of gold. Mount Morgan, in Queensland, that romantic old auriferous hill which for years was worked only for its gold, also became a rich copper mine, but, like the copper mines in New South Wales, that phase of its industry has now been halted.

From the yawning open cuts and underground tunnels of the Mount Lyell mines, centered about Queenstown, in western Tasmania, now comes a major portion of Australia's copper output.

Iron deposits are distributed widely throughout the continent. Iron Knob, an amazing hill of almost pure iron, west of Spencer's Gulf in South Australia, supplies most of the ore used by the large ironworks at Newcastle.

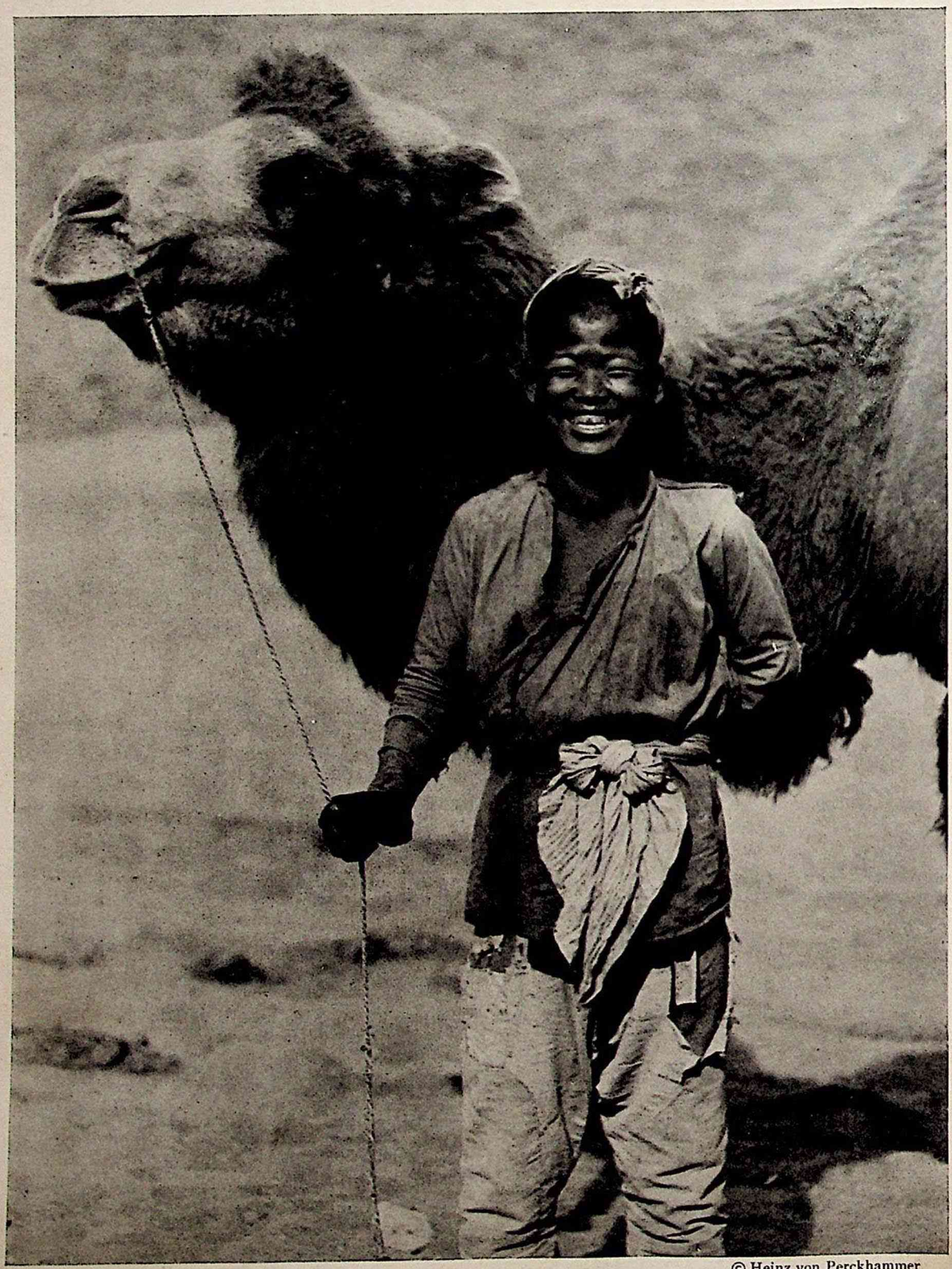
In earlier years iron and steel wares were secured more cheaply and easily from Britain, but the Newcastle steelworks, which represent one of the largest and most important industries in Australia, are now manufacturing increasing amounts of these products required by the Commonwealth.

Such, too, has been the history of many of the other manufactured necessities. Today, the hum of machines producing articles for local consumption is growing louder in the cities, and more and more people are regulating their lives by factory whistles, thus accounting in a measure for the increasing population of cities.

But to many the far horizons of outback Australia have persistent appeal.

One morning a bronzed stockman, still carrying his kit tied in a bundle, came to call on a Melbourne official. He had ridden 300 miles by horseback to Alice Springs, in the heart of Australia, and had then journeyed 1,500 miles by train to Melbourne to see about having another artesian bore drilled on his property.

Asked if he expected to be in town for a while, he replied: "Well, I reckon if I can get my business finished in time, I'll start back home on the afternoon train!"



© Heinz von Perckhammer

THE YOUTHFUL DRIVER'S MERRY LAUGH SEEMS TO MAKE THE CAMEL SMILE TOO

The ungainly animals sometimes get tangled with automobiles in traffic jams in Peiping. A railroad speeds freight between the metropolis and Kalgan, in Inner Mongolia, but wheels have not displaced this primitive four-legged transport. Besides making long hauls, "ships of the desert" bring coal and vegetables to Peiping from near-by villages (Color Plate III).

PEIPING'S HAPPY NEW YEAR

Lunar Celebration Attracts Throngs to Temple Fairs, Motley Bazaars, and Age-old Festivities

By George Kin Leung

FOR more than 4,000 years the Chinese people have used the Lunar Calendar. Peiping, until recently called Peking, the stronghold of conservatism in the North, observes with due respect the Government's desire that China "celebrate" with the modern world the New Year on January 1. But the former capital actually celebrates on the first day of the lunar first month, which in 1936 fell on January 24.*

This is not a case of stubborn clinging to old habits; the roots of the matter strike into deeper soil. The old calendar, having been used by man since time immemorial, follows the seasons, the times for planting the "good earth" that provides man with his food.

It is true to form that Peiping, with the innate polished courtesy of its citizenry, should bow affably and even low to the Gregorian New Year, but that the feasting, account settling, shop holidays, and all that sets the human heart in rhythm with the foremost holiday of the year should take place on the Lunar New Year.

Then winter is about to surrender its icy grip on the land. Farmers and city dwellers joyfully greet the first promises of springtime warmth that soon will once more stir life into growing things.

CASTING OFF THE OLD LEAF

In the Western World, there is the quaint idea that on the first of the year one "turns over a new leaf." In Peiping "one casts off the old" with a rat-a-tat-tat of firecrackers, and looks into the coming year full of hope. Those who have been sorrow-ridden must completely change their feelings if they are to find real happiness that year.

During the half-month celebration of the Lunar New Year, tens of thousands attend the temple fairs and bazaars which are centers of prayer, of animated bargaining at stalls, and of entertainment in the lavish variety that the Old Capital provides.*

Peiping citizens adore big crowds—"gatherings for people to see people."

Time is not the nerve-wracking, carefully treasured thing it is in the West. Therefore, in Peiping preparations, or the first stages of the celebration, begin on the eighth day of the Twelfth Moon, fully three weeks before the Lunar New Year.

On the night of the seventh day, a sweet pudding, consisting of many kinds of rice, beans, dates, chestnuts, and liberally garnished with red sugar, white sugar, melon seeds, pine nuts, and so on, is cooked. The simplest dish, however, must contain no less than eight ingredients.

Puddings are eaten by the family and presented to friends. Gifts should be made no later than the noon of the eighth. The custom dates back at least as far as the Sung Dynasty (960-1280). Pickled cabbage is sometimes eaten with the delicacy.

THE KITCHEN GOD ASCENDS TO HEAVEN

On the eve of the twenty-third, Tsao Wang Yeh, the Kitchen God, ascends to Heaven to report on the doings of the family for the year to the Jade Emperor.

The family offers the deity huge pieces of molasses candy, so that, when he is about to make his report, he is unable to extricate his teeth from the jaw-locking mass. Hay and a bowl of water are offered on the stove to the Kitchen God's horse, which squats with neatly folded legs on the paper picture of the deity.

When the ceremony, including the offering of a miniature paper ladder to facilitate Tsao Wang Yeh's celestial climb, has been duly performed, the paper picture of the god and other paper objects are burned and so sent up to Heaven.

The Kitchen God is speeded on his journey with the following admonition: "Tsao Wang Yeh, when you go up to Heaven, favorable words say many; unfavorable

* The old Chinese calendar is based on both the moon and the sun. Each year has twelve months, with an intercalary month inserted 22 times in 60 years. New Year's Day falls on the second new moon after the day of the winter solstice. Thus it never comes before January 20 or after February 20.

* See "Glory That Was Imperial Peking," by W. Robert Moore, National Geographic Magazine, June, 1933, and "Approach to Peiping," by Maj. John W. Thomason, February, 1936.



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PEKINGESE BOTH—A LEARNED MONK AND HIS TINY DOG

Scholarship is traditionally China's most honored profession. Under imperial rule, examinations were held every third year and high government offices went to students writing the best classical essays on Confucian philosophy. Some of the compositions had to be written in poetic meter. Nowadays, Peiping's old Examination Halls have given place to modern schools.

words, few; protect us and let all good things come our way."

Then the greedy mouths of the children devour the candy that was to have been Tsao Wang Yeh's. Thus for seven days, until the thirtieth, when the god's return is marked by the pasting of a new paper picture in his shrine, the household is free of the watchful eyes of the deity.

On the night of the thirtieth elaborate preparations are made by the rich, and simpler ones by the poor, "to cast off the Old Year" and to welcome the New. The courtyards are carpeted with sesame stalks, for their crackling sounds frighten off evil spirits. Illuminated lanterns of many forms are hung. The family enjoys a banquet, while women and children play dice and cards. All gods are worshiped at a fully decorated altar.

The auspicious hour is designated by the almanac. Firecrackers announce the departure of the Old Year and welcome the Gods of Wealth, Happiness, Longevity, and others.

THE PERIOD OF FESTIVITY

Then follows a period of unbroken festivity. In former times large shops closed for 15 days, but now three or five is the rule. Those who choose to do business conduct it behind shuttered windows and half-open doors. When the shops reopen, they begin with a clean slate.

Children are given their school vacations, so that the whole family is free to call on relatives and friends. Gambling in infinite variety—mah-jongg, dice, cards, and dominoes—is encouraged, especially in the country, where there is less diversion than in cities.

The theater is a favorite attraction to many, especially to the shopworkers of old-fashioned firms. The wealthy see Yang Hsiao-lou, Mei Lan-fang, and other national

celebrities, while the poor content themselves with the humble theaters in the Bridge of Heaven district. Talking films draw the well-to-do moderns and the old silent pictures appeal to those of moderate means.

Temple fairs and bazaars, however, attract people from all walks of life and truly mirror the festive spirit.

NEW CLOTHES FOR THE NEW YEAR

On New Year's Day, everyone dons his new clothes. Little girls appear in their bright silk or patterned cotton gowns; small boys have on the top of their tiny black satin hats a single silken ball of scarlet fluff, that being the color for joy and good luck.



Photograph by Branson De Cou from Galloway

MOTHER AND SON SQUAT IN A ROUGH-RIDING COVERED WAGON

Despite innovations such as rickshas and automobiles, the springless, two-wheeled Peiping cart, pulled by a mule or donkey, still is used. Sitting on cushions, passengers are shaded by a canopy stretched forward to two poles attached to the wagon's shafts.

The family, having worshiped the ancestral tablets, next do obeisance to grandparents, parents, and elderly members of the household. They then are free to call on relatives and friends. A friend of mine complained that he had so many elders to kneel to that his legs were sore. Gifts of flowers, food, and so on, are exchanged, while children receive money, sometimes wrapped in red paper, as well as toys (page 762).

The second day of the First Moon in Peiping is set aside for the worship of the God of Wealth. Most families who have abstained from meat on the first may now resume it, balls of hashed meat wrapped in a thin layer of flour paste being favored.

The seventh is Peoples' Day. If the weather is bright, mankind will thrive for the year; there will be little illness.

Propitious Stars is the festival of the eighth day, when temples and some wealthy families light 128 tiny lamps, hoping in this way to gain good luck for the year. Only one lamp may be used in families of moderate means.

THE DAY OF THE LANTERNS

The fifteenth marks the great Lantern Festival's peak, when certain temples and

large shops regale the public with displays of lanterns made of glass, silk, horn, and fine paper. The prosperous silk shops exhibit huge gauze lanterns in the form of vases, peaches, "good-luck" bats, and series of rectangular panels, which may cover a wall. Their surfaces are painted with scenery, animals, beautiful ladies, or with characters from familiar novels and dramas.

Streets abound with examples of the art of the old-time lanternmaker, but the ingenuity of the craftsmen does not end here. I saw one lantern in the form of a modern locomotive. It had a light in its cylinder-like belly and was inscribed with the English "A15," preceded by the Chinese characters meaning "Special Express."

ITINERANT MERCHANTS AND WAYSIDE POETS

The fifteenth for most people marks the end of the active celebration of the New Year in Peiping, but the climax of temple celebrations falls on the eighteenth, when the Pai Yün Kuan (White Cloud), the richest temple of Taoist faith in the region (page 776), holds its intriguing festival, "Meeting the Genii."

Selling by an army of venders and itinerant merchants appears to be as important as the burning of incense at the altars of temples where most fairs are held. Hosts of these small merchants who move from fair to fair depend on the New Year income.

Early in the season, there may be found anywhere on a busy street or near a temple the table of a scholar who has fallen on evil days and seeks to earn a few coppers writing "spring couplets." These are composed with a brush in black ink on strips of red paper. A set is translated as follows:

"Precious yellow gold and green jade, who owns them?
"White sun, blue heaven, our Nation's flag."

These are pasted on either side of the door. The second statement is a recent patriotic innovation, referring to the national flag. Above the door is placed the phrase, "Unity for all nations," yet another modern note. Shops prefer such pithy four-character phrases as "Opening business; great prosperity."

Even a servant who may earn only a bare living buys New Year pictures to put on his walls and windows. Peddlers cry these wares in the streets.

In the old days, gaudy, crude, but not unattractive pictures, done by wood block on large thin sheets of paper, were popular. They represented actors, fat infants ardently desired by all, or an entire family performing seasonal ceremonies, while the God of Wealth has his heavenly assistants roll into the house wheelbarrow loads of silver and gold ingots.

In addition, the God of Longevity and the celestial pantheon were shown, showering down upon the lucky human recipients all their heart's desires.

Now these are considered by many as "too old-fashioned." In their stead are foreign-style lithograph horrors whose colors rival the comic sheets that might easily have been their inspiration. Some of the fat Chinese babies have been retailored into wobbly male children in black tuxedos, cuddling dumplinglike infant brides attired in frilly pink European dresses and fluttering veils.

Flat paintings on scrolls, sometimes framed, are much desired for this season. They are sold in shops, on the street, and in mat sheds erected for the short holiday.

"DOOR GODS CHANGE SHIFTS"

Well known to the outside world are the door gods, who guard the household from intrusion by evil spirits. New Year is the time to renew the paper pictures of gods that are pasted on doors and walls.

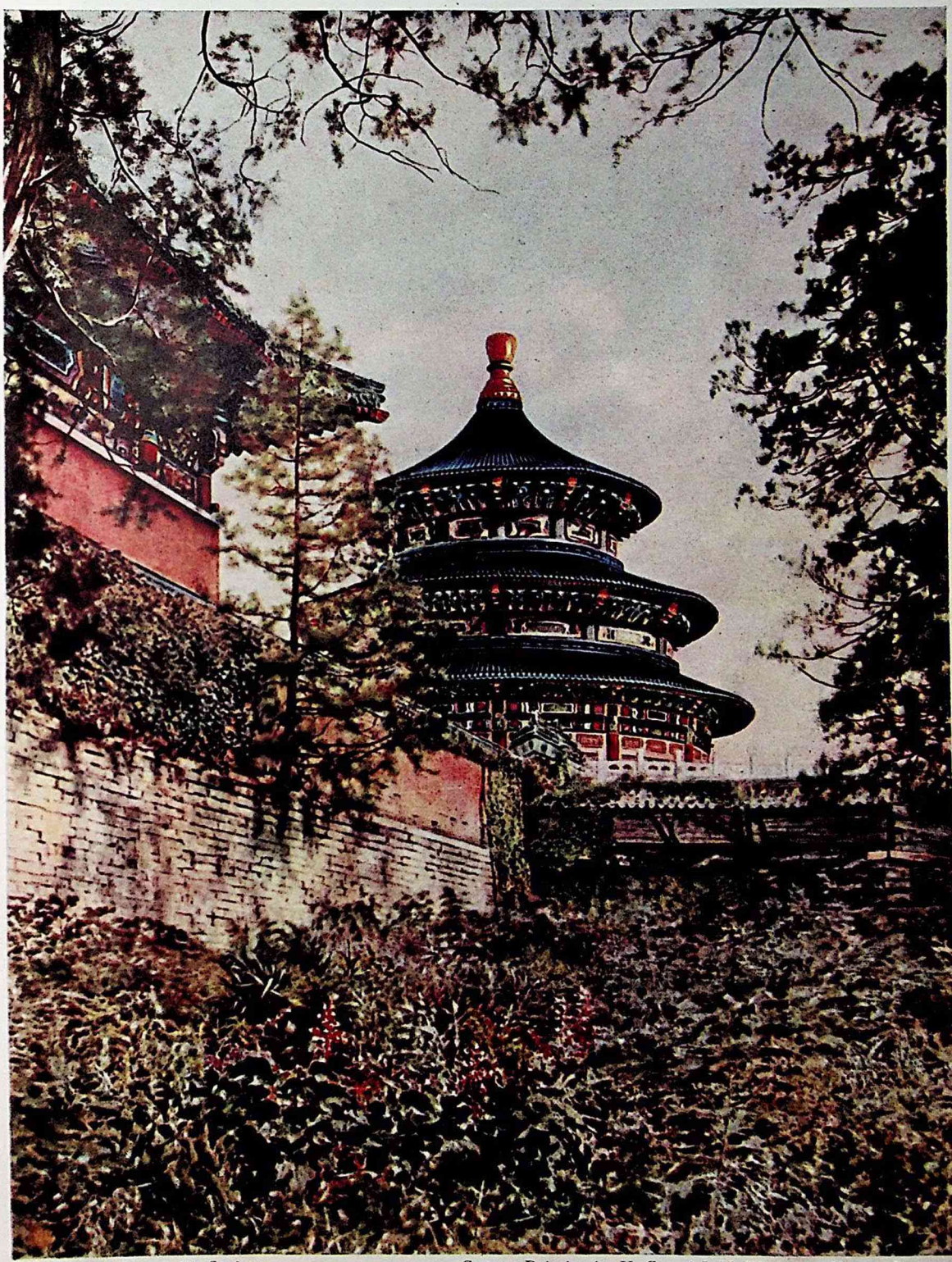
Recently it has been urged that the personages of the Tang Dynasty (618-907), who later became deified as guardians of the door, be replaced by more worthy figures, national heroes such as Yo Fei, who valiantly fought the Chin Tatars, and Wen Tien-hsiang, who in the face of hardship remained true to the last Sung emperor during the flight to Kwangtung.

One newspaper reporting this change headed its article: "Door Gods Change Shifts."

Flowers and plants, which have been forced in hothouses to bloom at the Lunar New Year, are offered in profusion at market fairs.

Favorites are tree peonies, the narcissus, magnolia (or "jade-orchids"), "welcoming spring," and Buddha Hands, a yellow citrus fruit shaped somewhat like a hand.

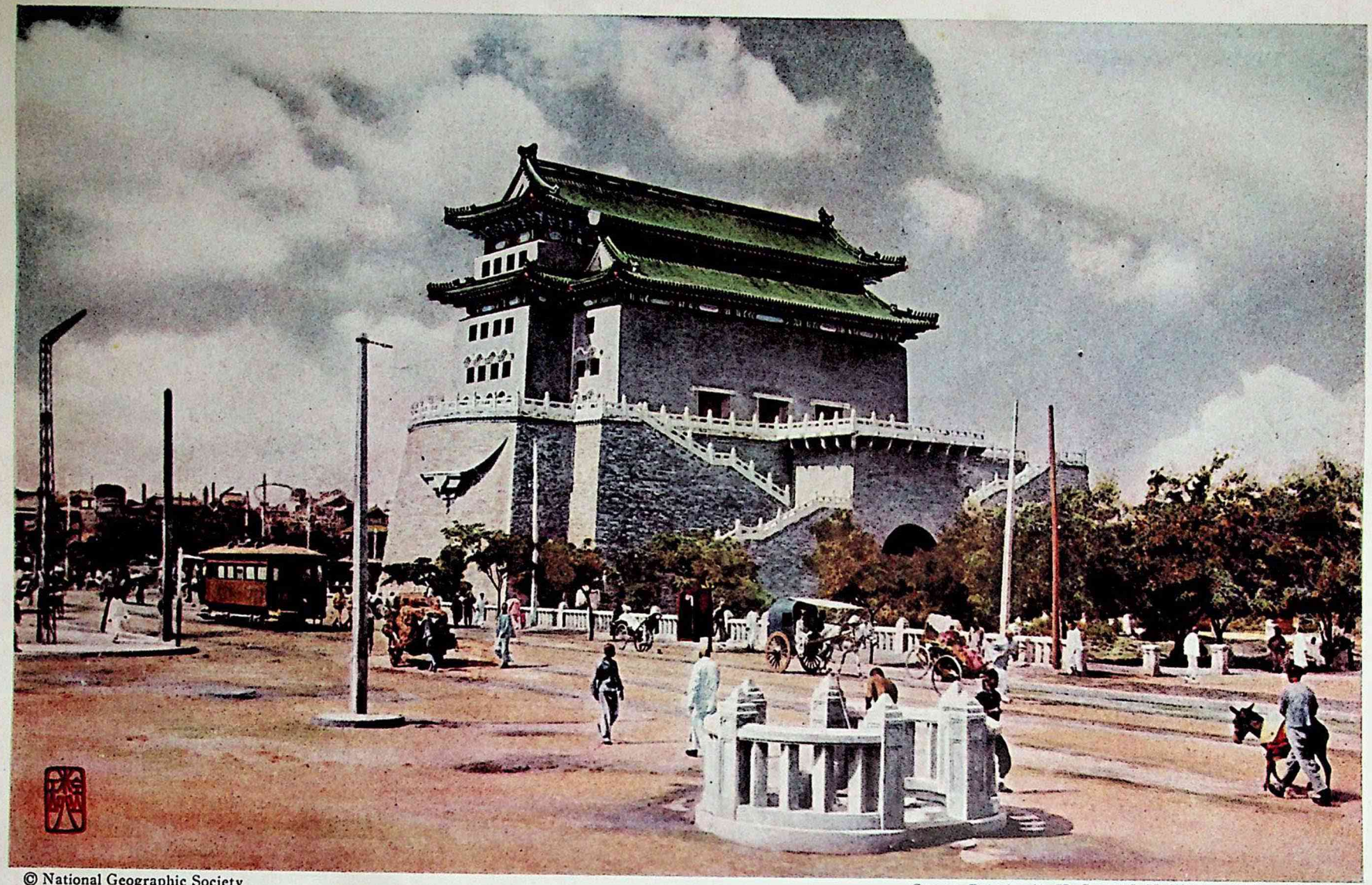
Curio dealers spread their tempting wares on tables at bazaars and in some temples. The collector of jade, ivory, and carved semiprecious stones will find here paradise



© National Geographic Society Camera Painting by H. C. and J. H. White and Hwang Yao-tso

EMPERORS PRAYED FOR PROSPERITY IN THE AZURE-TILED TEMPLE OF THE HAPPY YEAR

Annually at spring plowing time, China's rulers begged God for good harvests. Often called "Temple of Heaven" by foreigners, the circular, triple-roofed building, rising from a white marble terrace, is only a part of the vast walled shrine devoted to "Old Grandfather Heaven" (Plate IV). Huge Oregon pine logs were imported when the temple was rebuilt after a fire in 1889. These photographs of Peiping and vicinity were taken by the White Brothers and specially painted by the Chinese artists Deng Bao-ling and Hwang Yao-tso.



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Camera Painting by H. C. and J. H. White and Deng Bao-ling

FRONT DOOR OF PEIPING IS THE CHIEN MEN

Through this fortification in the Tatar City wall the Emperor used to pass from his palace to the Temple of Heaven (Plate I). The gate's emerald-glazed roof is 99 feet high to accommodate good spirits, which, according to necromancers, soar at 100 feet! A street sprinkler draws water from a stone-enclosed well on the avenue, where a blue-hooded Peiping cart, a wheelbarrow, and rickshas contrast with a modern streetcar.

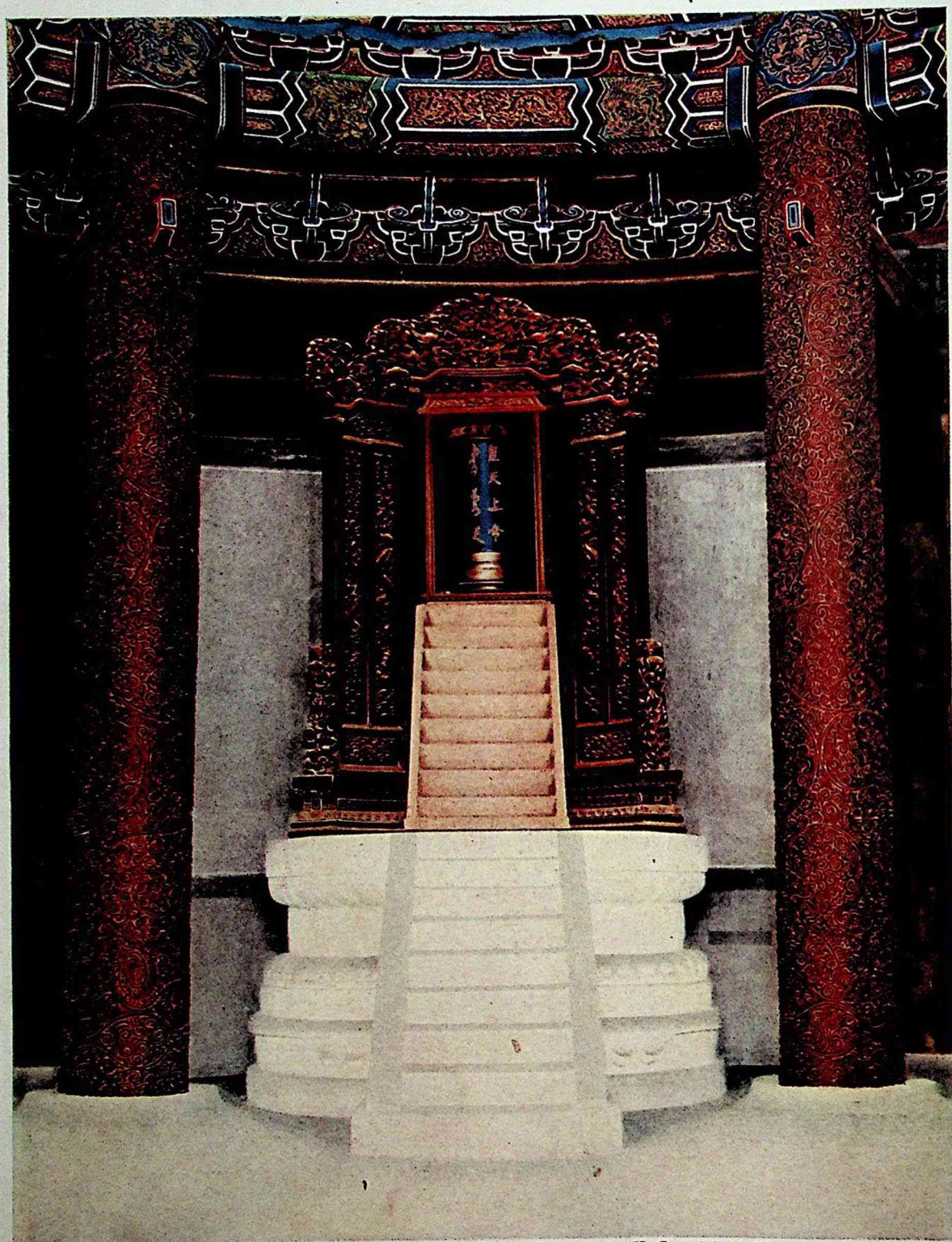


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MARCO POLO SAW SUCH CAMEL CARAVANS PLODDING FROM PEIPING MORE THAN 600 YEARS AGO

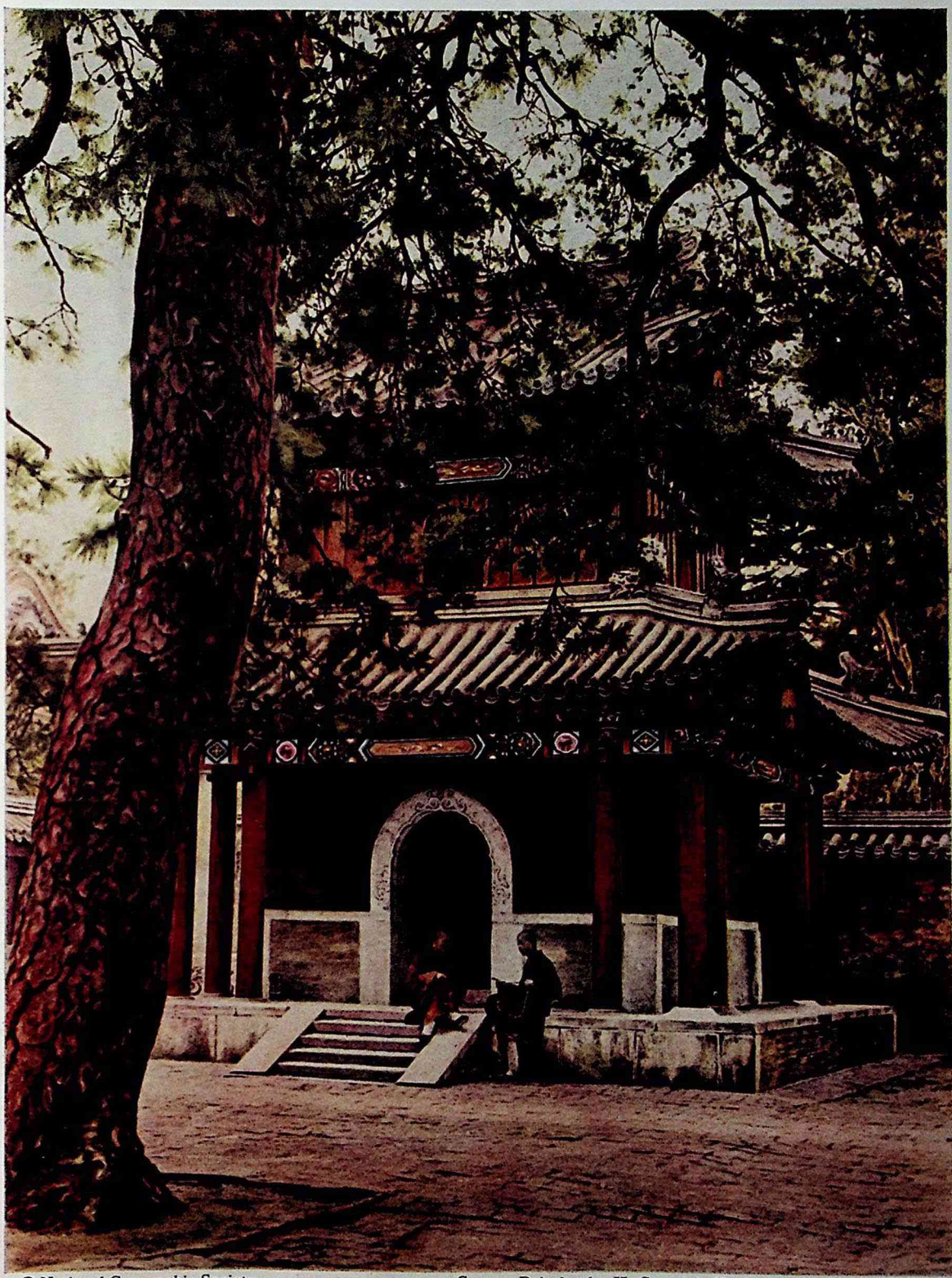
"To this city," wrote the Venetian traveler, "everything that is most rare and valuable in all parts of the world finds its way." Then, as now, two-humped Bactrians with bright saddles, roped in single file, lined highroads between Peiping and the lands beyond the Great Wall. Its coal or produce unloaded, this train, returning to the Western Hills, passes a sentry box near the city's battlements, partly hidden by weeping willows.



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SIMPLICITY MARKS THE SUPREME DEITY'S SHRINE

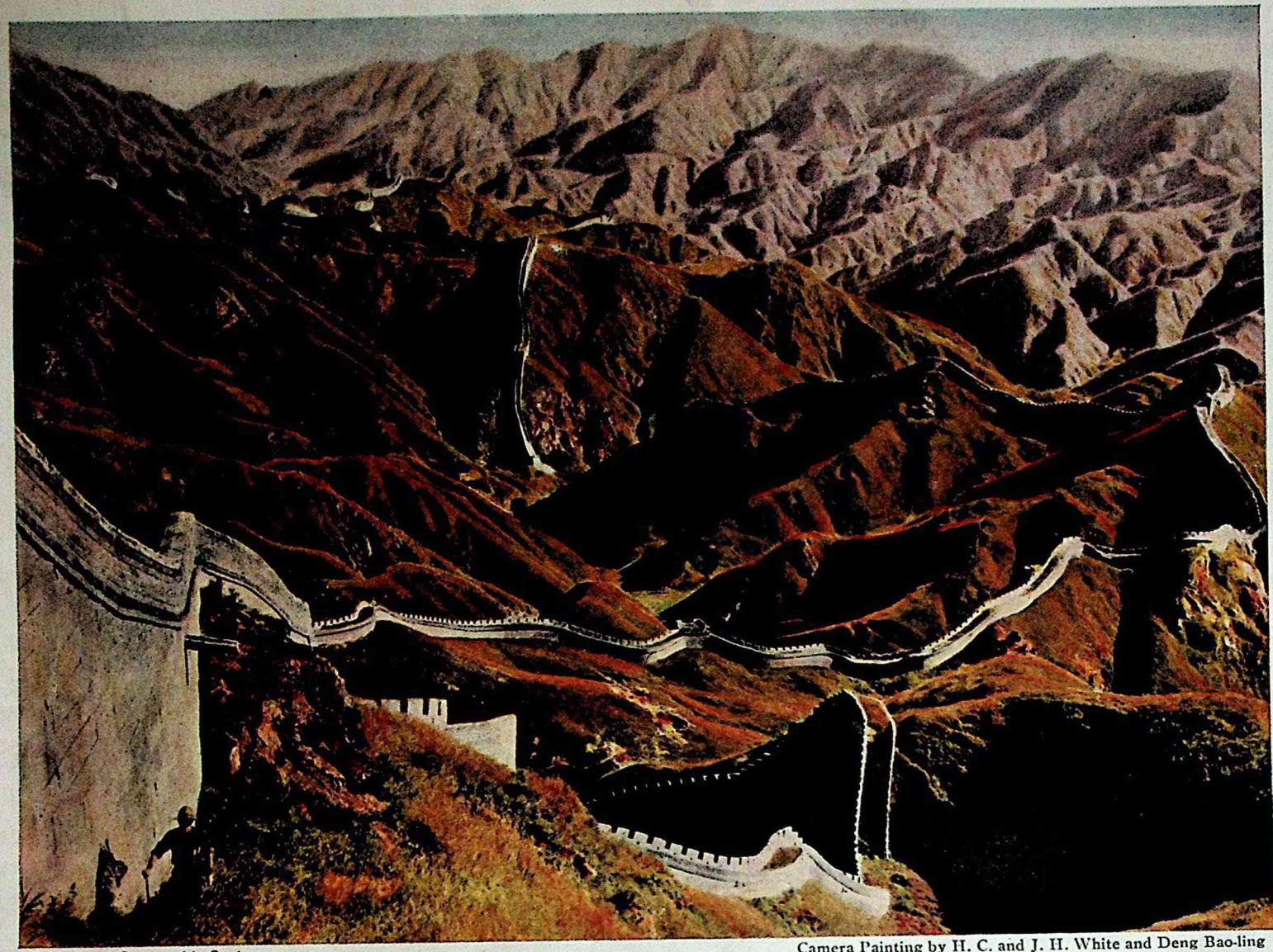
Enthroned in a jewellike rotunda within the walls of the Temple of Heaven, the cylindrical blue tablet bears four golden Chinese and three Manchu characters signifying "Shang Ti, Ruler of the Universe." Ancient Chinese believed in a single God, and even recent emperors sacrificed to Him at the Altar of Heaven. Today the people worship a host of divinities, mostly Buddhist and Taoist. China's Mohammedans number from 15 to 20 millions, Christians between three and four millions.



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VENERABLE PINE BOUGHS VEIL A BUDDHIST MONASTERY'S DRUM TOWER

At midnight, when boys take their vows at the seventh-century "Monastery of the Ordaining Terrace," in the Western Hills near Peiping, a priest's assistant beats the huge drum inside this red-pillared building. "He taps the ancient face and it sobs . . . it moans like the wind in a forest of pines. Again it roars . . . alternately crashing like thunder . . . or whispering like throbbing heart-beats." Two monks with rosaries chat beneath the eaves, whose upturned ends bear dragons and tinkling bells.

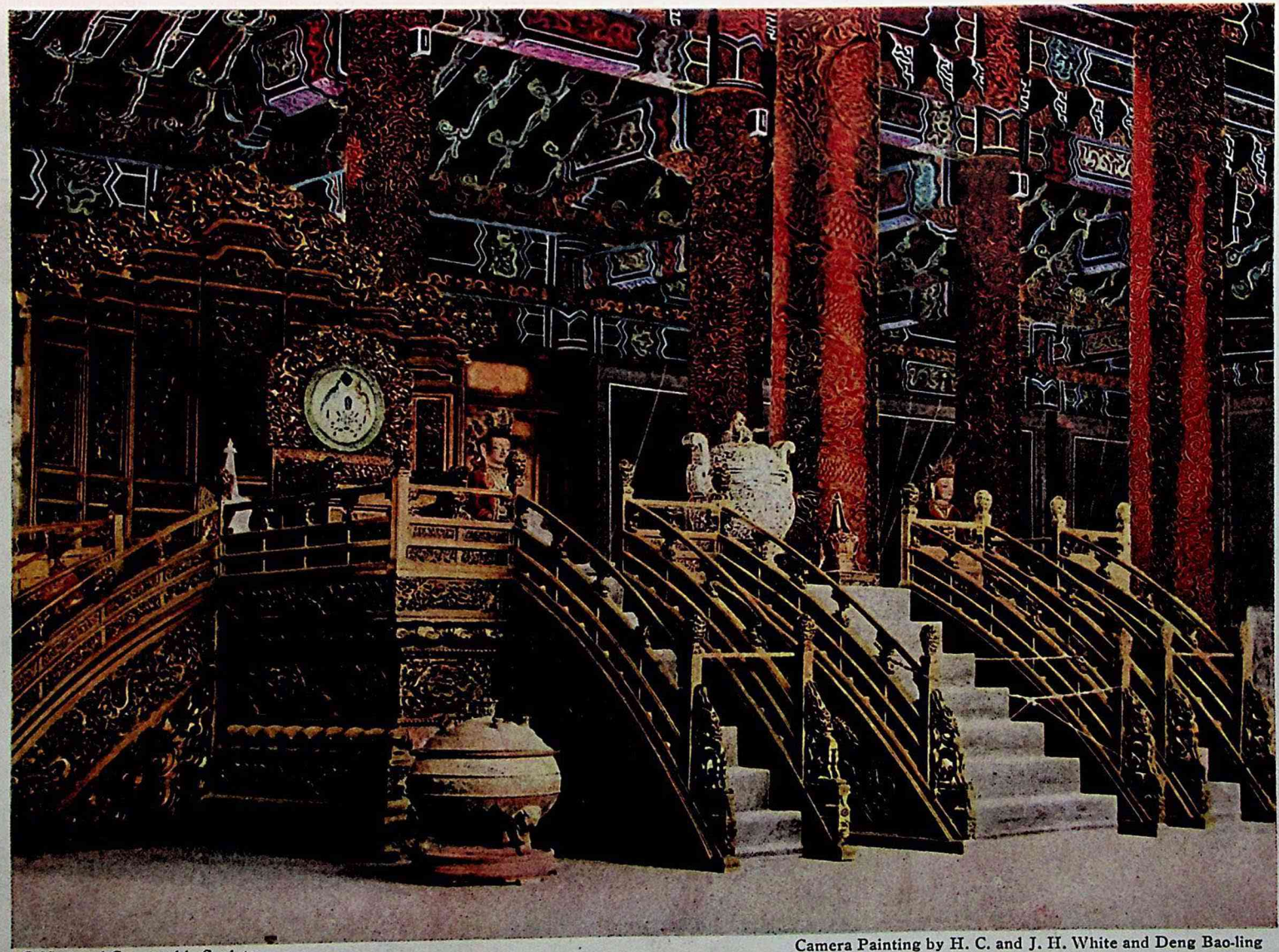


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TRANSPLANTED TO AMERICA, CHINA'S GREAT WALL WOULD STRETCH FROM PHILADELPHIA BEYOND TOPEKA, KANSAS

Spurs would jut south into Virginia and Arkansas. More than two centuries before Christ, drafted laborers by hundreds of thousands built this giant fortification, seen here near Nankow Pass, northwest of Peiping. Watchtowers, often only 100 yards apart, guarded against surprise attack.

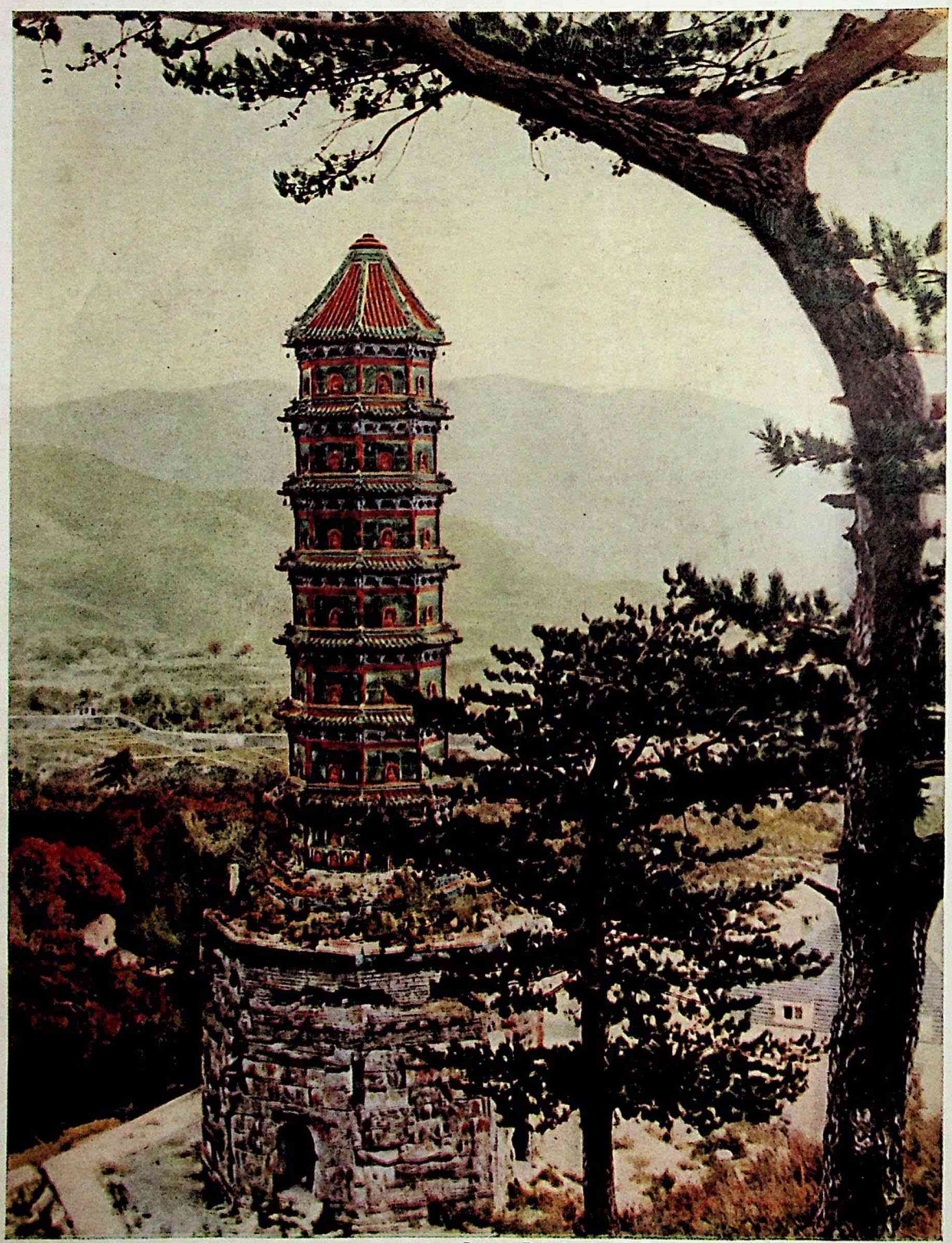


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IN THE "HALL OF SUPREME HARMONY," ENTHRONEMENTS, IMPERIAL BIRTHDAY CELEBRATIONS, AND NEW YEAR'S RECEPTIONS WERE HELD

Carved on the dais and screen are 99 five-clawed dragons. When the Emperor, the "Dragon's Person," took his seat in this palace of the Forbidden City, 100 dragons occupied China's throne! A Buddhist image sits on either side near the stairs.



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A "TOWER OF PORCELAIN, STRANGE AND OLD," STANDS WHERE EMPERORS HUNTED

Unharmed by time are the pagoda's green and gold encaustic tiles, with tiny bells dangling from the eaves; but the masonry base is crumbling. Beyond twists the wall of the former imperial hunting park in the Western Hills, where "Sons of Heaven," with brilliant retinues, chased deer and boar. No longer a game preserve, the park now contains an orphanage, a sanitarium, and many summer homes. Once forest-clad, most of the hills have been stripped for firewood.

or purgatory, depending on whether he obtains or fails to obtain what he wants at his price.

The "tea p'êng" men (*p'êng* being the temporary mat shed erected over the tables), who go from fair to fair, frequently remind you that you had your last pot of tea at their stall a few days ago at a temple several miles away.

VENDER CARRIES HIS STOVE ON A POLE

Everywhere are displayed vast quantities of food. There is the modest one-man restaurant, the vender carrying his stove on one end of a stout pole that rests on his shoulder, while his dishes, condiments, and utensils repose in a wooden box suspended from the other end. Luscious roasted sweet potatoes, little round cakes, steaming hot and incrusted with sesame seeds, vats of jellylike bean curds, bowls of noodles, and numerous other things are there.

The Mohammedan peddler with shining brass scales puts up a sign proclaiming that all his food and utensils are strictly orthodox; that is, they contain no lard or pork, and everything is extra clean.

At most fairs, one finds forestlike rows of brown or white rods from the ends of which flutter pink, green, or yellow triangular paper flags. On close inspection, the rods turn out to be lengths of small hawthorns, which are literally "haws on a rod." Some are coated with brown sugar, while others are plastered with a whitish sugary paste. These long, edible batons, or "great sugars," are the delight of children (page 789).

A GAME OF "NUMBERS"

Popular in the home and at temple fairs during the holiday are games of chance. The simplest outfit consists of a man reciting in a singsong voice what his game is about. On receipt of a large grimy copper coin, he thrusts into the hand of the donor a folded paper. When a number or symbol has been picked from a receptacle, the holder of the corresponding one is awarded, amid the gaping admiration of the crowd, a few packages of cheap cigarettes or a pair of imposing bottles of watery toilet water.

Many try their marksmanship with popgun, toy cannon, crossbow, or bow and arrow. Well patronized is the game wherein clay dogs, teacups, packages of cigarettes, and so on, are placed in a rectangular space on the ground. The aspirant pays a copper coin or two for wire hoops having what seems to be a superanimated "spring" when they hit the ground. Standing at a specified distance, one must make the hoop lie perfectly flat about the object in order to win it.

In broad daylight, under the very golden sun, one may see movies. The lone spectator thrusts his head into a black cloth bag and sees what he can. There also are "listenees," antiquated cylinder gramophones, with rickety earphones reminding one of a physician's stethoscope. These diversions have a conspicuous place among the food stalls, merchandise booths, and acrobats who entertain the throng.

Everywhere are the toy sellers. Chinese playthings are brightly colored, cleverly made, reasonable in price, and, though fragile, remain intact at least as long as does the child's interest. The festival mood is never so complete as when one beholds mass upon mass of bright-colored windmills or "wind wagons," scores of little cardboard wheels on a bamboo rack that make fussy clattering noises in the wind.

KITES, GOURDS, AND DIABOLOS

Next in popularity are kites, noise-producing glass gourds (page 789), diabolos, and shuttlecocks. Kites may be in the form of a fantail goldfish with huge gyrating eyes, or a dragon whose head tugs at the cord while each segment of its long body and tail wags in a windy sky (pages 762, 766).

Diabolos, called "hollow bamboos," are so constructed that they produce a loud whirring noise when spun on a cord between two sticks.

Shuttlecocks vary from the stubby, green-feathered affairs, obtainable for a few coppers, to superb examples topped with long, sensitive feathers.

Popular with children are the men who knead from rice flour miniature figures of stage and legend. With lightning speed and a few dexterous rollings of the bits of colored rice paste, they bring the charming little people to life under one's very eyes.

On January 23-25, 1935, a leading merchant of the district north of the Teh Shing Gate, held a successful fair to boom the business of his neighborhood. He obtained the co-operation of the booth merchants and religious organizations which perform free at temple celebrations in staging a festival at the Black (Lama) Temple. He man-



Photograph by George Kin Leung

A DRAGON KITE IS THEIR NEW YEAR'S PRESENT

Rouged, powdered, and attired in their holiday best, two little girls emerge beaming from a popular kite shop at the Liu Li Chang Fair (page 791). Behind them stare the enormous round eyes of a goldfish kite (page 766).

aged the time cleverly, in that the holiday spirit had already begun with the eating of *la pa chu* pudding as early as January 12, though New Year's Day was not until February 4.

PROMOTING TEMPLE PATRONAGE

Thousands of people poured from city and countryside toward the dilapidated temple. Rickshas abounded, although many farmers came in the two-wheeled Peiping carts (page 751). The more active city dwellers often got off their rickshas at the gate and rode the rest of the distance to the temple on donkeys. So numerous were bicycles that a temporary yard with a tiny office was erected for checking the vehicles.

There was a sprinkling of glass-windowed carriages drawn by Mongolian ponies. But the "tigers of the city streets," streamline motorcars, although in the minority, tore along the dusty road, scattering people left and right and leaving blinding clouds of brown dirt on those behind.

Soon the noble approach to the Black Temple was lined with hundreds of rickshas, two-wheeled carts, wheelbarrows, and shining motorcars, while closer to the entrance were arrayed the booths of toy peddlers, food venders, and so on. In the courtyards were games of chance and all manner of small merchandise.

For many who made the journey, the main drawing card was the societies who offered their stunts, some of high artistic quality, such as those of the "lion men" (pages 774-5 and 788).

Folk songs are sung by men in costumes, while others, garbed as intrepid warriors of old, display their prowess in wielding the "five tiger clubs."

On this occasion, a "mad" Taoist priest attracted such an enormous mob that the law stepped in. The priest, either stark mad or exceedingly clever, in that his antics drew a crowd from which he could beg alms,

strode lustily into the main hall. Garbed in a voluminous robe, carrying bundles of stringy rags, and having in his picturesque turban a single quivering feather, he presented a weird figure.

The climax of the episode came when he stood gesticulating in front of the sacred images and in highly musical cadences began to revile each and every god in the choicest Peiping profanity. To the intense regret of all, the police and one of the leading merchants escorted the priest out and thus dammed the flow of his versatile vocabulary

Most temples hold their regular worship on the first and fifteenth day of each month of the Lunar Calendar. The first day of the First Moon, however, is a big occasion at the old Yüan (Mongol) Dynasty (1280-1368) Taoist temple, the Tung Yüeh, situated outside Chao Yang Gate. A long line of emperors have been patrons of the place, Kang Hsi and Chien Lung being two of the rulers who made repairs on the buildings (page 764).



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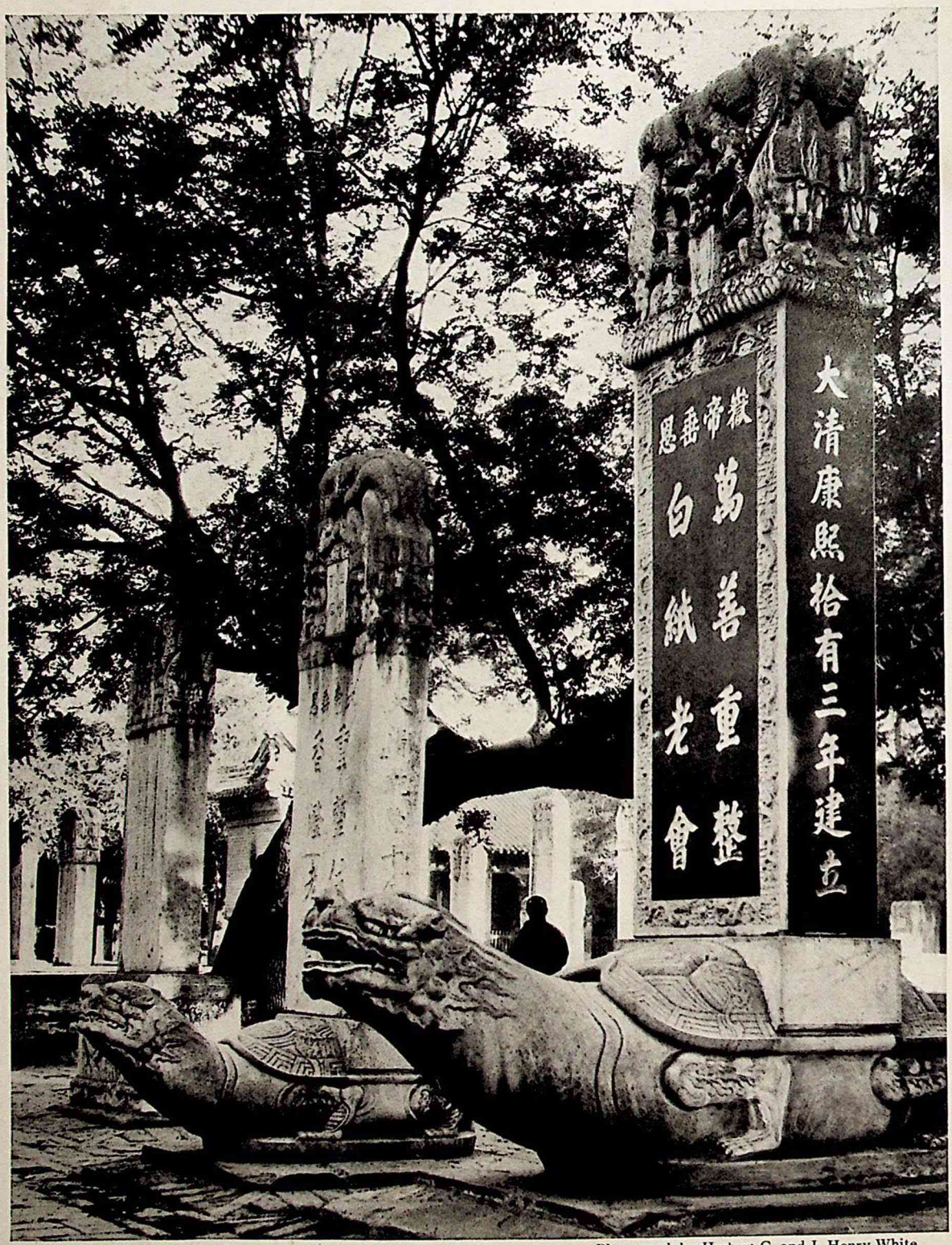
"I RESPECTFULLY WISH YOU BLESSINGS OF JOY"

Thus two gentlemen of the old school, wearing queues, greet each other on New Year's. Instead of grasping one another's hand, each bows and shakes his own clasped hands in the time-honored manner. Queues, imposed on the Chinese by their Manchu conquerors, mostly disappeared after the Revolution in 1911. Silk or cotton gowns, such as these men wear, are the usual winter dress. They are thickly padded, or are lined with fur.

INCENSE HELPS "GODLY BREATH"

Apart from the bright-colored toys which greet the eye at the entrance, brisk trade goes on between religious visitors and incense peddlers, not to mention the famous incense shop close at hand that swarms with buyers (page 787).

One writer remarks that as soon as one puts foot into the temple, he immediately feels a strong, "godly breath": that is, religious atmosphere. The devout carry yellow or orange cloth bags which contain incense sticks and coppers for mendicants. Underlying the idea of giving is the belief that the donor will receive reward from the gods either in heavenly blessings or in earthly gain.



Photograph by Herbert C. and J. Henry White

STONE TORTOISES BEAR HUGE TABLETS PRESENTED BY BYGONE EMPERORS AND PILGRIMS TO TUNG YÜEH TEMPLE

A favorite symbol in Chinese art, the tortoise is the emblem of longevity, strength, and endurance. Visitors to temples often take home copies of famous tablet inscriptions. Reproductions of the indented surface are made by placing thin paper on the stone and rubbing the sheet with a substance like lampblack (page 763).



Photograph by Branson De Cou from Galloway

CHINESE FOOT TRAFFIC SEEMS TO HAVE THE RIGHTS OF ALL WAYS

Pedestrians often throng the middle of the street, just as they did for centuries before sidewalks were laid. Here a soldier, and citizens in long silk or cotton gowns, crowd past two rickshas. When first imported to Peiping, about 50 years ago, rickshas were denounced by the carters' guild, whose members asserted that the two-wheeled conveyances would relegate men to the status of beasts of burden.

The thickest clouds of incense smoke rise in front of the shrine to the God of Wealth. Who in Peiping and the whole world does not worship and court the favor and gifts of that popular potentate?

Decidedly sought after is the "Old Man under the Moon," who arranges marriages. There is a belief that a parent may find an ideal mate for his son or daughter by borrowing, unknown to either, a scarlet cord from this deity. If this is tied across the door on the eve of the New Year and is touched by the person, he or she will be married that year. That the god is very "efficacious" is known to all.

Great is the fame of the bronze mythical beast, popularly thought by Peiping worshipers to be a humble donkey, which may be found in a room at the rear of the temple. You have only to touch that part of its body corresponding to where you ail to have a speedy recovery (page 787).

The high flames from mountainous offerings of bundles of incense and the throngs pressing through the well-kept halls of worship transport one back some centuries to a peaceful world that knew nothing of the newfangled doubts that beset our times.

It is, nevertheless, a relief to step into the large paved courtyard where ancient evergreens let dappled sunlight fall upon the stone flooring and upon the innumerable rows of imperial tablets given by rulers of old. Here are games in which people try to hoop a clay dog or teacup (page 761), while long neat counters serve alfresco meals.

Surrounding the main courtyard is a series of small rooms, in which are installed the figures of 72 judges and the victims they are sentencing, not to mention the demons who stand by to see that everything will be carried out as commanded. The hapless souls are doomed to pay the penalties in purgatory (page 773).



Photograph by George Kin Leung

HOLDING A BUTTERFLY KITE, THE GIRL SEEMS ALMOST PART OF THE TOY

Above her leers a comical goldfish, whose huge goggle eyes roll fiercely in the wind. The butterfly, a dazzling blue with black dots and a pink center, is made of strong paper stretched over a light bamboo frame. Kiteflying is a favorite amusement for grownups as well as children (page 762).

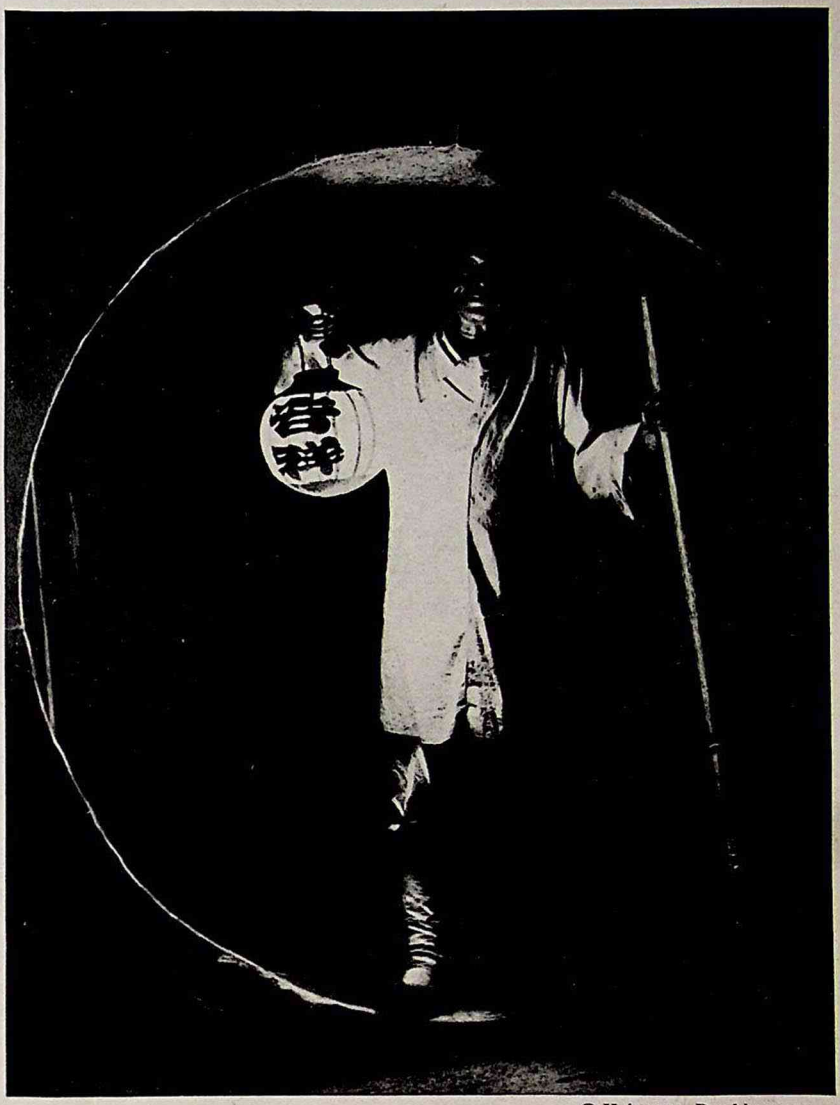


Photograph by Branson De Cou from Galloway

ONE-MANPOWER TRUCKS CREAK AND RUMBLE AS COOLIES CHANT

The rhythmic clamor is a familiar sound in Chinese cities, not only by day but sometimes far into the night. Coolies frequently emit cries like "Ho!" and "Ha!" in time with their steps. Songs of Peiping cartmen are a factor in making the former capital one of the world's noisiest cities.

The second day of the First Moon is in Peiping the great day for worshiping, or rather asking favors of, the images in the Temple of the Five Efficacious Gods of Wealth. These deities, according to one of the many tales associated with the little temple, were once real men, Chinese Robin Hoods, who took the money of the unrighteous rich and bestowed it upon the deserving poor.



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"WHO GOES THERE?"

Through a moon gate peers a temple watchman, paper lantern in hand. In Peiping a doorway may be a gem of art. Many are vase-shaped, with exquisitely carved stone borders.

"THE FIVE EFFICACIOUS GODS OF WEALTH"

The grateful populace buried them here, and in the reign of Chien Lung (1736-1796) the temple was built. It is known to be an especially efficacious shrine that stands among the farms a few miles outside the Chang Yi, a gate toward the southwest part of the city.

That a shrine or small temple stood on the spot at an earlier date is proved by an inconspicuous black tablet carved with Chinese characters and embedded in the bricks of the east wall of the main hall of worship. Important statements therein are translated as follows:

"The Temple of the Five Efficacious Gods of Wealth in Willow Lane Village was built during the Ming Dynasty, but there is no way to discover the exact date. From the Second to the Ninth Moon of this year (1786) donations have been collected, so that the main hall of worship and the two side buildings have been completed. Then to one side this tablet was erected. On the fourth day of the Tenth Moon, philanthropists (of this temple) met and reverently offered theatrical performances (to the Five Gods of Wealth).

"In the thirty-third year of Chien Lung (1768), donations were obtained by the priests to build the stage, the temple gate-door, guest rooms, monks' dormitories. Again contributions were gathered in public places to the extent of some hundreds of ounces of gold to put up a requisite building: namely, the three rooms of the west hall. Now it is the fifty-first year.



Photograph by Carl Lieb

FOUR TINY HEADS PEER INTO A PEEP SHOW

The children have paid a copper apiece to look into the box at a strip of "moving pictures," manipulated by the proprietor. Scenes include out-of-date singsong girls, American cowboys, and buxom Broadway chorus beauties of the gay nineties. On the wooden stand beside the box is a miniature orchestra, with leather drum, cymbals, and other instruments, all operated by one man.

"Fifty-first year (1786) of Chien Lung, the first to the tenth day of the Tenth Month."

A RACE TO BURN INCENSE

Long before dawn, crowds of people and swarms of vehicles move toward the gate, which has been closed for the night. As soon as the barrier is opened, the vast murmuring, rumbling tide of humanity, donkeys, rickshas, bicycles, and motorcars shoots out into the country in a dusty race to the temple, because "the one who gets there and first burns incense will certainly become wealthy during that year." This is called "snatching and burning the first incense."

From 4 a. m. on, crowds from the city and the surrounding villages continue to swell. Formerly an imperial highway, the new motor road between Chang Yi and the shrine becomes thronged with people "like carp swarming across a river." When the main hall no longer can accommodate the vast crowd, many go out to the courtyard and do their obeisance. Even that is so crowded that if one does not take care when he kowtows toward the shrine, he may bump his head on the back of the person immediately in front of him.

A TROUGH OF FLAMING TRIBUTES

Although the censers in the hall are far from adequate for the endless stream of incense, the huge cement trough in the courtyard is piled high with flaming offerings. When even that overflows, bundles of incense are stacked into roaring heaps on the stone paving itself.

Ingots of gold and silver, made of cardboard and covered with silver or gilt foil, are offered to the gods, into whose inclosures they are tossed with the clear understanding that the worshiper will receive, in return, a large amount of wealth.

In the courtyard behind one may buy ingots which are said to bring riches to the owner. These are so keenly sought after that one must be an energetic elbower to reach the counter and snatch one.

After mine had been in my pocket for some time, I noticed that the thin silver foil had rubbed off one of the ingots and I could see a bit of English newspaper that formed the base of the object. I could plainly make out the large Arabic numerals "89 cents"! Perhaps that was all that was coming to me in the Twenty-fourth Year of the Chinese Republic, 1935!

All day long the crowds besieged the small doors of the temple, much to the gratification of the peddlers of bright gewgaws, most of which had auspicious forms and names suggestive of good fortune. Fish, made of red paper, were inscribed with the characters for "Prosperity," "Have," and "Surplus."

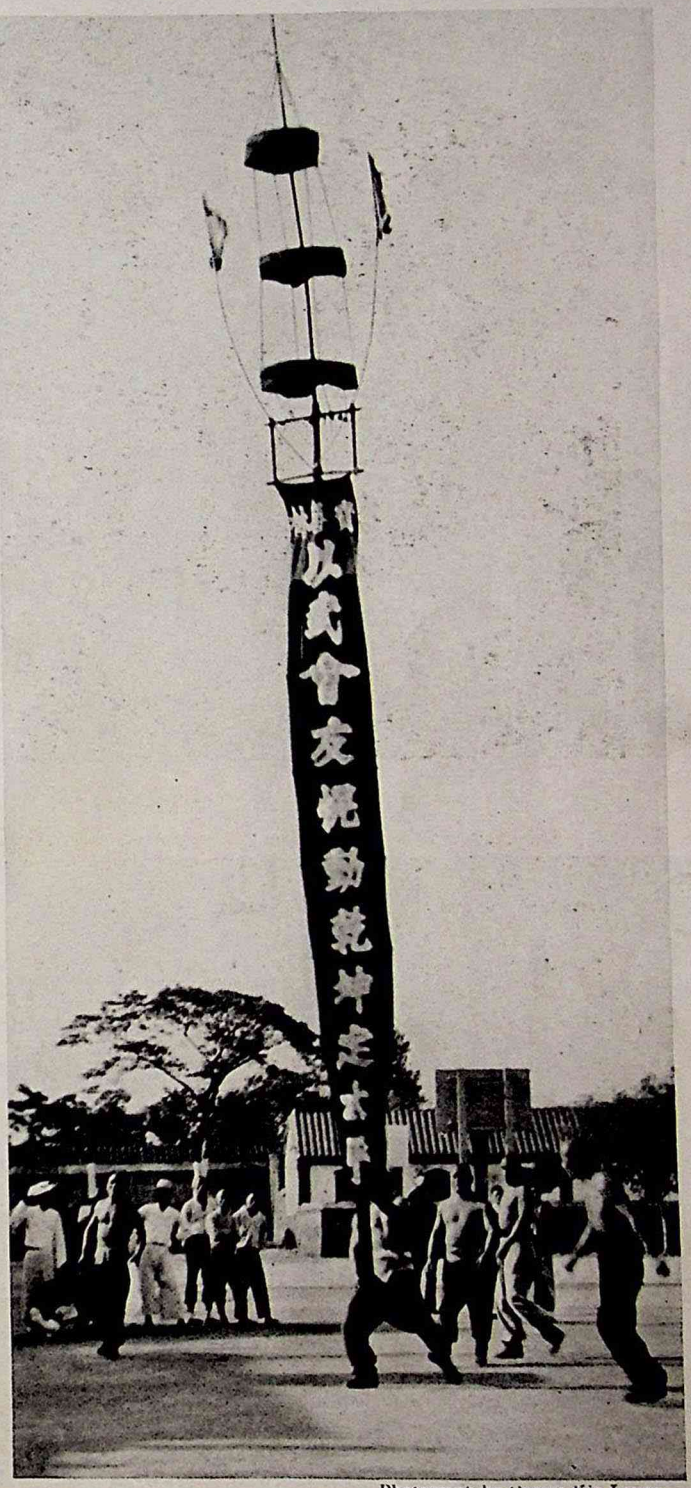
PUNS AND PETITIONS

The sound for the character for "surplus" is the same as that for "fish," there being a pun on Peiping words which makes it lucky and efficacious in the extreme.

Scarlet chenille ornaments in the form of bats, the sound also being the same for "prosperity," are pinned into hats. When a peddler slyly says, "Take home a bat," he also means to take "good luck" home.

At the temple and far into the city, from dawn to twilight, one sees cyclists, motorists, and people in rickshas wearing hats encrusted with fluffy scarlet bats, phoenixes, and other symbols for a lucky year.

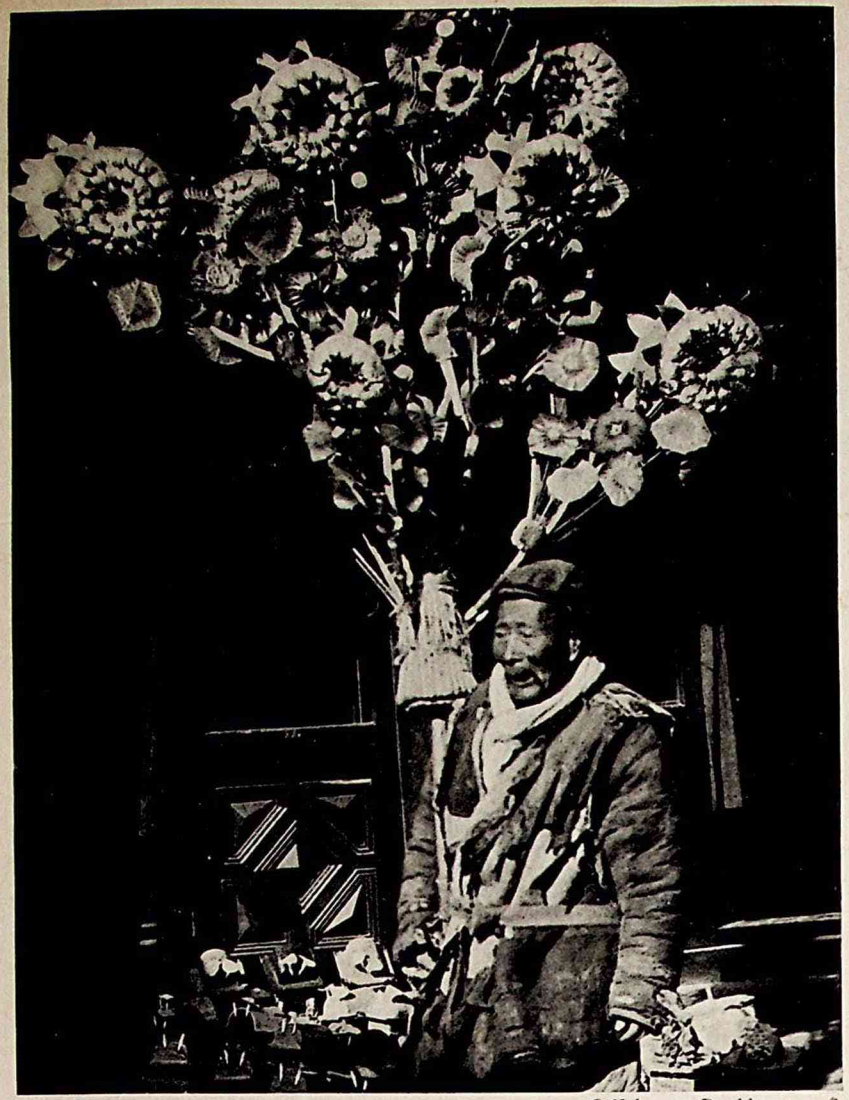
The Great Bell Temple, situated outside a gate at the northwest corner of the city, still holds its modest fair, consisting of a few stalls and entertainers that remind one of past glory. During the Ching Dynasty the place was much frequented in the New Year season for the racing of Mon-



Photograph by George Kin Leung

JUGGLING THE BAMBOO POLE

The performer balances it with effortless grace, first on one hand, then on a single thumb! He tosses it at wide angles, making the long banner and three umbrellalike canopies swing alarmingly over spectators' heads. An expert can balance the pole on his forehead and toss it onto the small of his back.



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ARTIFICIAL FLOWERS "BLOOM" FOR NEW YEAR CELEBRATIONS

A street merchant hawks his wares during the festival. These "blossoms" often deceive the eye; they are cleverly made of paper and fastened to real branches, the ends of which are stuck into a bundle of rice straw.



Photograph by Herbert C. and J. Henry White

ALERT TO FILL A PRESCRIPTION FOR DRIED SNAKESKINS

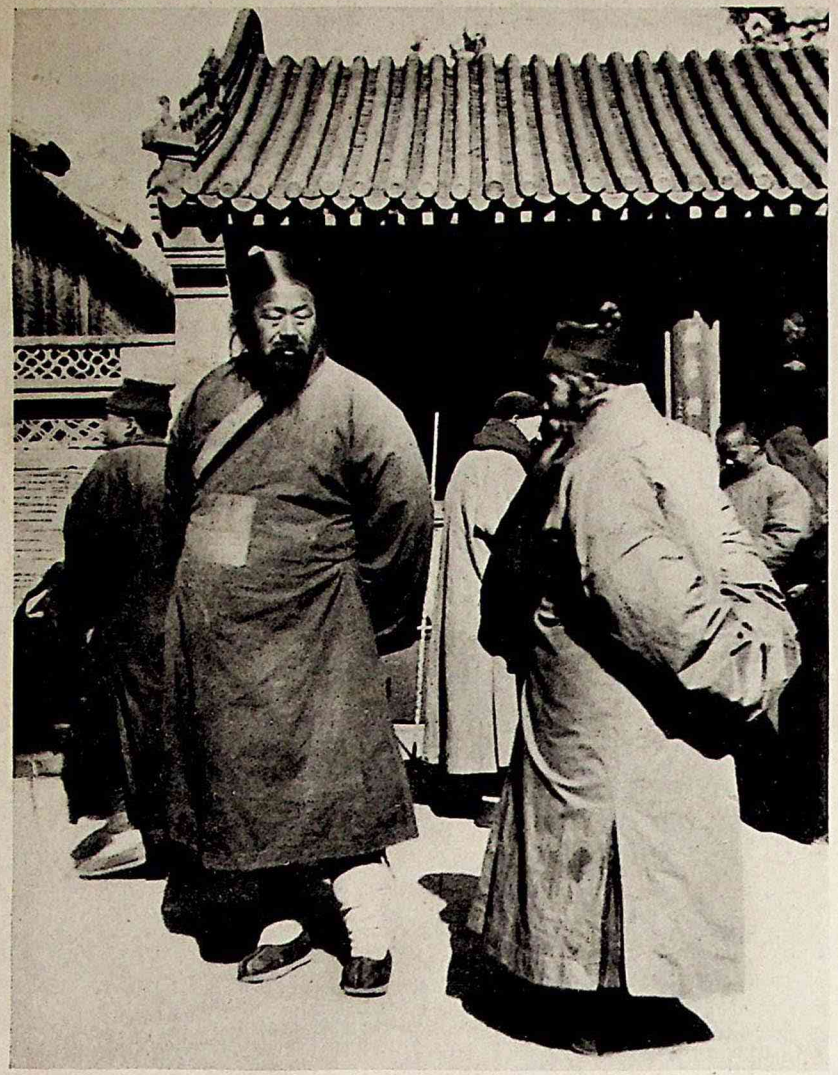
The wares on this Peiping pharmacist's table include fragrant herbs, tiger whiskers, or pulverized bones, and such cure-alls as the "Great Blessing Pill," the "Double Mystery Pill," or the "Pill of Ten Thousand Efficacies."



Photograph by Herbert C. and J. Henry White

BARGAINS ARE HERE—IF YOU KNOW HOW TO DICKER WITH THE WILY DEALERS

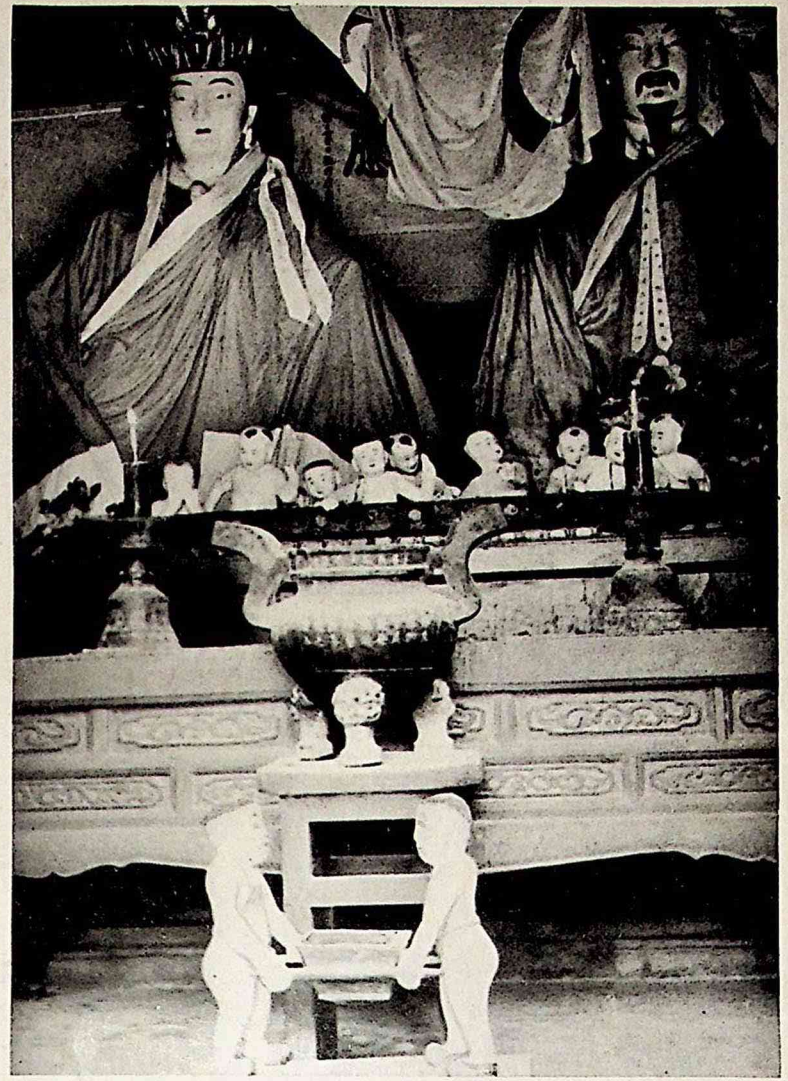
Peiping's Bureau of Social Welfare has prohibited bargaining, in an effort to improve business ethics, but few shopkeepers or customers can refrain from indulging in the age-old pastime (page 785). This display of wares at the Lung Fu Temple fair includes dishes and vases of porcelain, bronze, and cloisonné. The upright wooden screens with carved jade centers (two on top shelf) are typical ornaments in many Chinese homes.



Photograph by George Kin Leung

BEARDED TAOIST PRIESTS BEG FROM TEMPLE TO TEMPLE

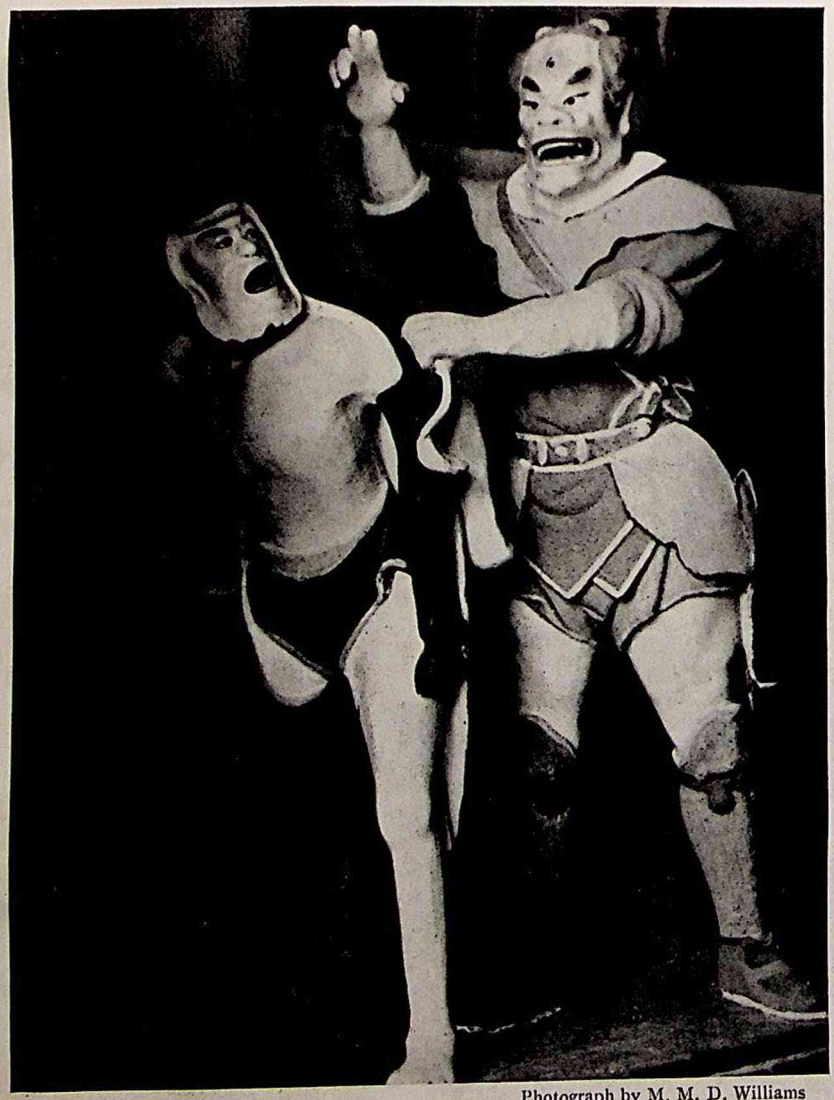
These two mingle with the crowd at Pai Yün Kuan on the 18th of the First Moon, an important day of the New Year's festival (pages 775-6).



Photograph by M. M. D. Williams

CLAY BABIES ROMP BEFORE THE GIVER OF SONS AND GRANDSONS

Their nursery is the altar in the shrine of the beloved goddess and her bearded husband, in the Tung Yüeh Temple (page 763).



Photograph by M. M. D. Williams

A DONKEY BEATER'S PUNISHMENT FITS THE CRIME

In purgatory this sinner, who in life had mistreated his faithful beast, is reincarnated in the animal's form. One leg already wears hide and hoof. The left arm is thrust into a donkey's foreleg by the fierce demon (page 765).



Photograph by George Kin Leung

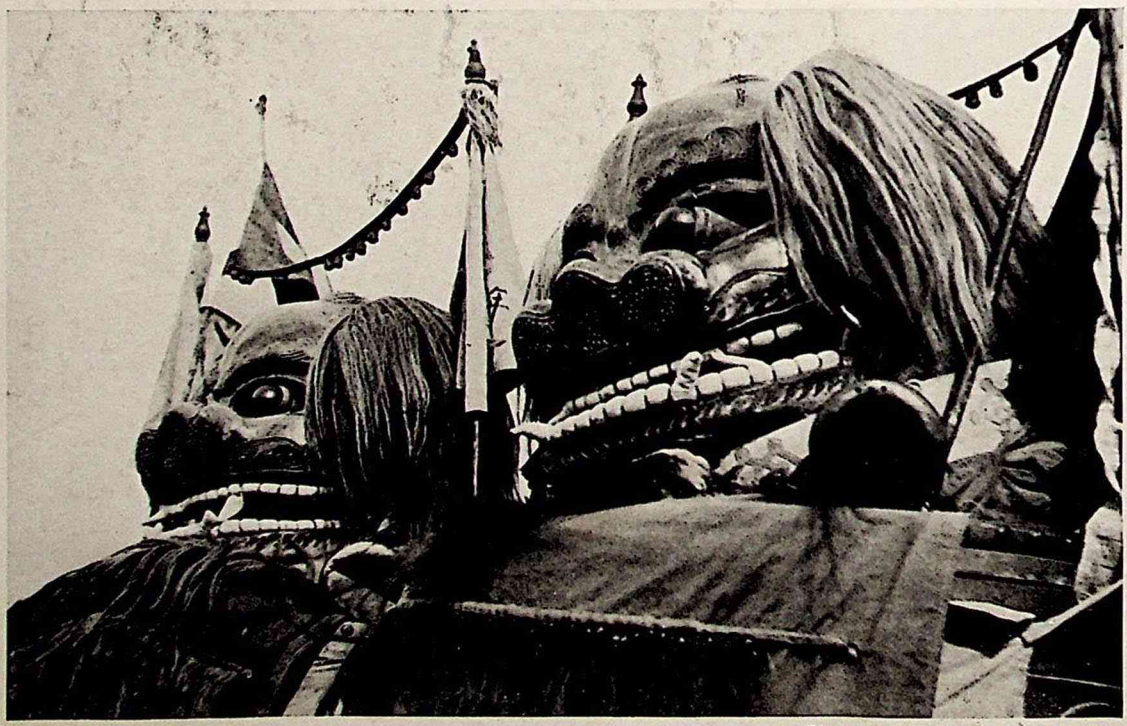
A TAOIST PATRIARCH KEEPS WARM IN A COAT OF MANY COLORS

The patchwork garment may be none too heavy for Peiping's rigorous winter weather. Stationed before a bronze incense burner at Pai Yün Kuan, the aged priest begs worshipers for copper coins (page 776).



A RAPT AUDIENCE WATCHES AN ACROBAT BALANCE ON ONE HAND

With shouts onlookers applaud a skillful performer. The elderly man on the left wears an old-fashioned, round Chinese hat. The individual in a light-colored gown, to the right of the acrobat, has a thick fur cap with earflaps turned up. Western-style felt hats are numerous.



Photographs by George Kin Leung

MEN IN FIERCE LION HEAD MASKS PERFORM FROM TEMPLE TO TEMPLE

One of the grotesque papier-mâché heads with shaggy ears is cobalt blue, the other old gold (opposite page). The lion's body is a long piece of cloth ridged with silky green or orange hair.

golian ponies. Now people go there to enjoy its charming rustic atmosphere.

Always of interest is its mammoth bronze bell, cast during the reign of the Ming emperor Yung Lo (1403 - 1424). The inside and outside are covered with thousands of beautifully written and cast characters of the Buddhist Hua Yen Sutra.

THE BELL THAT MOANS LIKE A MAIDEN

Often told is the legend that the caster of the bell, on finding that he could not obtain the desired tone, was in danger of his life from the emperor's displeasure. His daughter, knowing that a virgin's blood only could perfect the alloy, leaped into the molten mass. Even to this day, the good country folk say, the mighty bell, when struck, moans like the sigh of a maiden.



Photograph by George Kin Leung

A LION MAN IS ALL SET TO DON HIS FIERCE HEAD AND GO INTO HIS ACT

The performers work in pairs, one manipulating the head and the other the tail. The long-bodied beast jumps about with lifelike antics, now standing on its hind legs, now scratching violently at a persistent flea; again it dashes down a hillock or scrambles up a steep incline. The "tail man" provides most of the comedy.

On the fifteenth, which is the peak of the Lantern Festival, two small temples hold "open house." One is the temple of the district in which Peiping is situated.

The Temple to the City God is on the big street some distance to the west of the Hou (or Ti An) Gate and contains in its courtyard a massive figure said to be a fire god. It is apparently constructed of a brick base over which is plastered reddish clay. When incense is burned at night in its hollow interior, fire and smoke curl out of its navel, eyes, ears, nose, and mouth.

In the Eastern Large Market in the South City a modest celebration is conducted at the Temple of the God of Medicine. The thoroughfare is well known to foreign residents, for here all manner of old hardwood furniture, as well as more modern articles, may be purchased.

On the eighteenth and nineteenth of the First Moon is the climax of the 19-day fair

held in the Pai Yün Kuan, or White Cloud Temple (page 752), one of the oldest and certainly the largest and wealthiest Taoist temple in the neighborhood of Peiping. When Ghengis Khan acknowledged as his teacher the great sage Chiu Chu-chi, the Tatar conquerer called the group of buildings here the Temple of Eternal Spring (Chang Chun Kung).

The sage-abbot is indeed referred to as Chang Chun, his tomb being in one of the great halls. Of all the vast throngs which attend temple fairs during the Lunar New Year, the greatest by far is that which gathers here on these two days.

Entering, one sees the long, yellow banner containing a black dragon, the fair symbol used in imperial days. To the sides are food and tea stalls, while in the great space in the center are multitudinous bright-colored windmills, rods of sugared haws, and glass fruits that sparkle in the crisp Peiping sunshine.

TOUCHING THE CURATIVE MONKEY

When you pass through the middle of the three arches leading to the second inclosure, you notice that everyone reverently touches a tiny carving at the right end of the white stone border. So black and smooth has the object become from years of rubbing that you may have to be told that it represents a monkey, a creature of supernatural quality. If rubbed on any part of its body, it will effect a miraculous and immediate cure of the corresponding part of the supplicant's anatomy.

Those who have no ailment finger the little animal all over to insure themselves good health for the coming year.

Crowds gather about the two pits on either side of the Bridge That Imprisons Winds, under the arch of which two old Taoist priests sit all day in deep meditation.

One legend concerned with this bridge is delightfully characteristic.

Long, long ago the present Temple of Heavenly Peace was called the Temple of the Autumnal Winds. The abbots of the two temples, quarreling over the division of land, became bitter adversaries.

The fact that the neighboring temple used "Autumn Winds" in its name was an intentional effort on the part of its abbot to do harm geomantically to White Cloud Temple, for everyone knows that "When the autumn winds rise, O! white clouds scatter."

But the old abbot of the endangered temple was not to be outdone! He at once built the Bridge That Imprisons Winds, under which was the cavern (arch) for confining winds so that as soon as the "autumnal winds" blew there, they were safely imprisoned within the cavern under the bridge and no harm came to the "white clouds."

With the geomantic danger completely overcome, White Cloud Temple has continued to prosper down through the centuries to the present day.

An entire half day may be pleasantly spent wandering through the labyrinthian courtyards, of which there are four main ones arranged on the central north and south axis. On either side are innumerable smaller shrines, courtyards, a kitchen with gigantic caldrons for feeding the priests, a handsome pagoda which marks the grave of one of the three famous holy men buried in the precincts, and a small artificial mound made of broken bits of chinaware.

Pigs here are allowed to live until a natural death overtakes them. This practice, according to Buddhist teaching, brings great merit to the donor of the animals. Usually there are to be found in one of the sunny courtyards one or two priests who claim an age over the century mark.

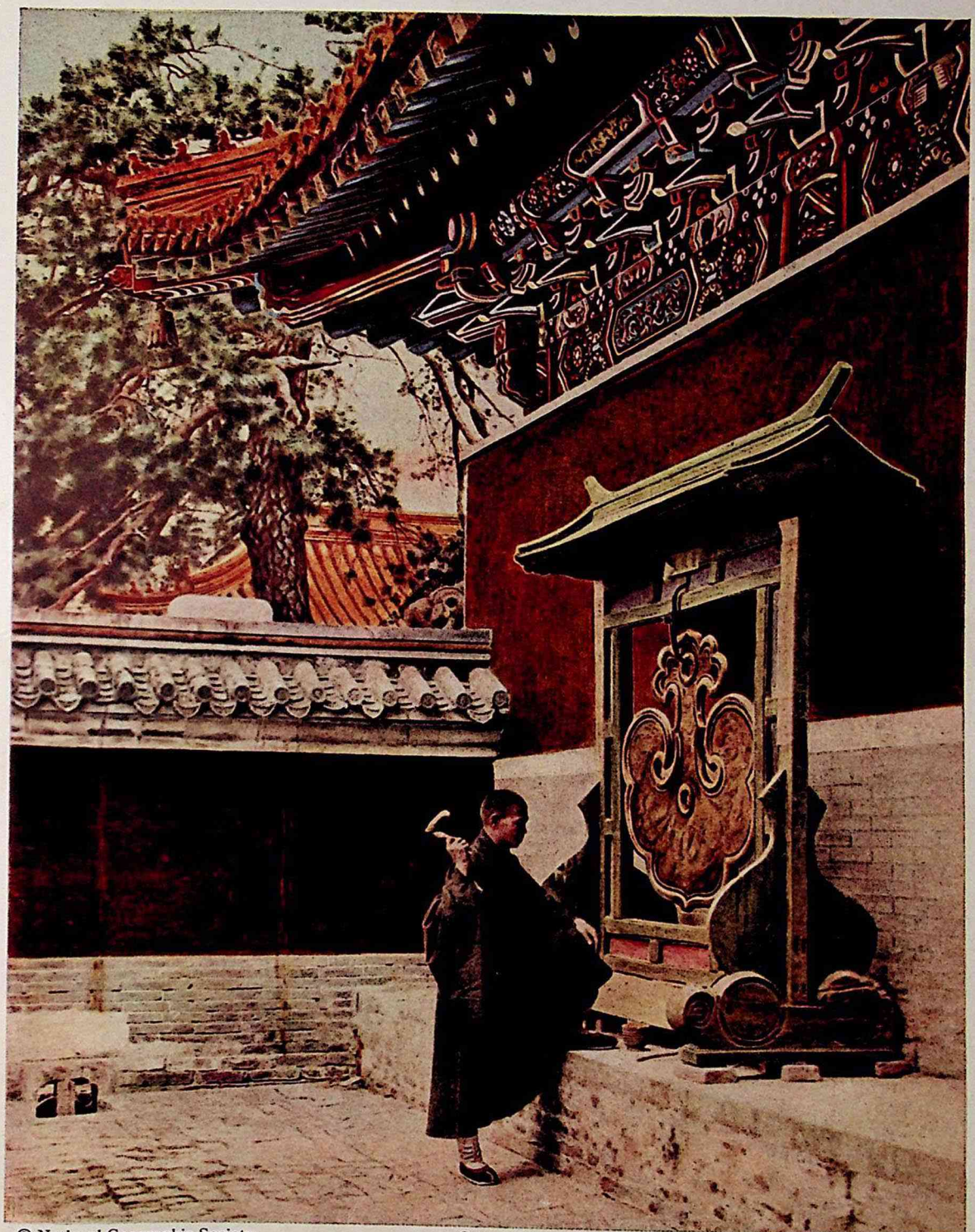
To the extreme north is a rockery, a garden, and an open-air stage.

Unlike many other temples, the White Cloud is well kept. Each shrine possesses a complete equipment of tapestry, altar ornaments, and handsome old horn lanterns, and every establishment is a delightful artistic unity.

On the side walls and at the rear of the great halls of worship in the central courtyards hang an infinite variety of lanterns, faced with gauze and often rectangular.

The lanterns on the walls of Chi Chen Hall tell, in pictures, of the life of the great sage, Chang Chun. Striking are the four large square lanterns, their points set in wooden stands and containing the characters Wan Ku Chang Chun—"Ten Thousand, Ancient, Eternal, Spring."

The last two refer to the abbot-sage. His huge food or alms bowl, which might comfortably accommodate several square feet of coppers, seems a product of the mind of the same genius who conceived the idea of hitting "the gold piece's eye" with coppers (page 789).

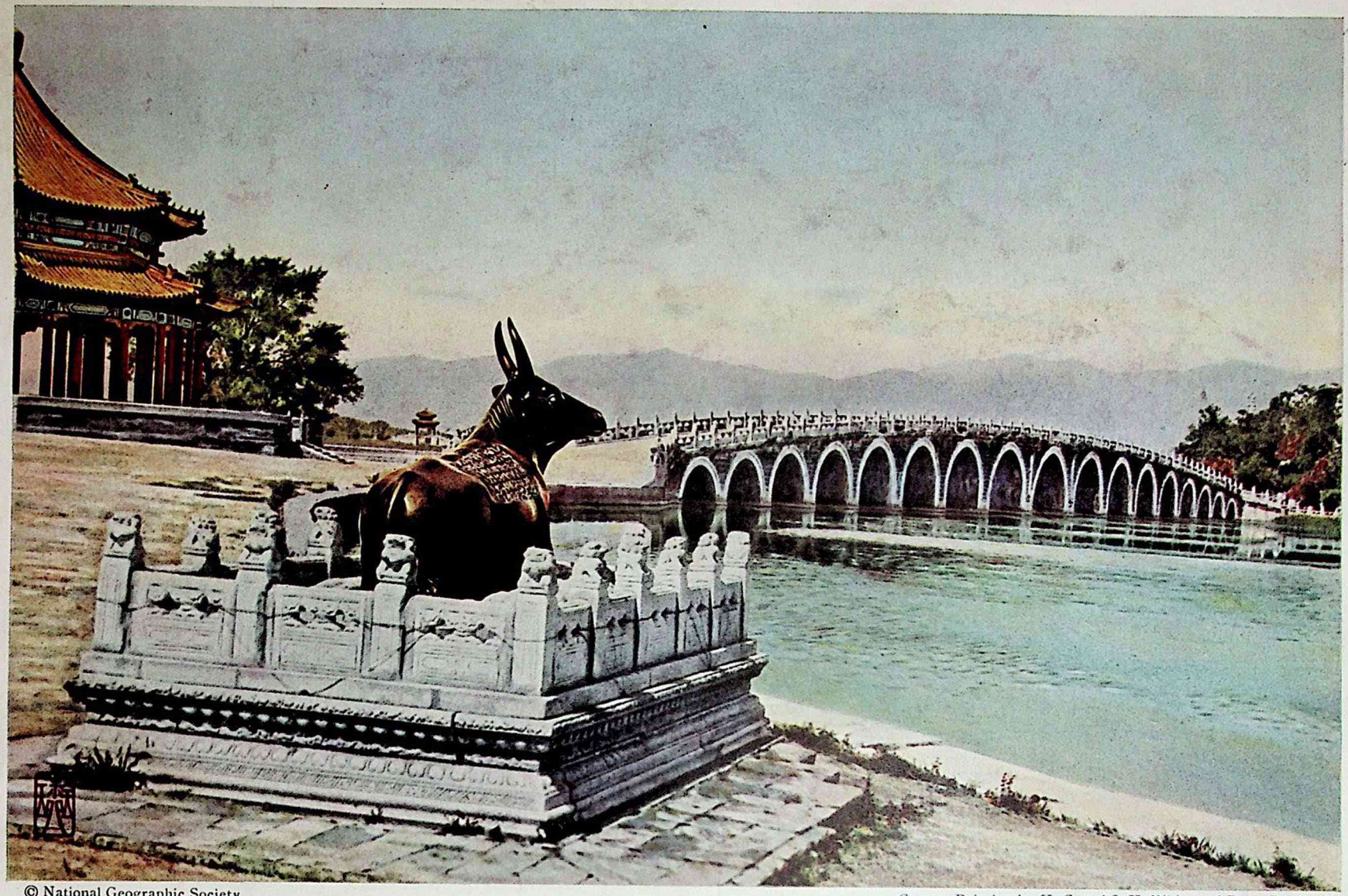


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"TIME FOR MORNING PRAYERS!" BOOMS THE BIG BRONZE GONG

Striking it with a hammer, a young priest summons devotees at the "Monastery of the Ordaining Terrace" (Plate V). Each spring, thousands of pilgrims, or "incense-burning guests," flock to this and other famous shrines in the Western Hills. Upcurved roof corners, characteristic of Chinese architecture, may have been adapted from the tent or primitive thatched hut; and the guardian dogs of yellow porcelain may have originated in the weights placed on tent tops to keep them from blowing.



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MAGIC "FLOOD INSURANCE" IS THIS BRONZE COW, CONFRONTING THE SUMMER PALACE LAKE AND 17-ARCHED MARBLE BRIDGE

From the gaily painted tea pavilion, left, the bridge leads to a rocky, temple-crowned island where a few years ago a hospital was established.



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Camera Painting by H. C. and J. H. White and Deng Bao-ling

SHOES FOR SLEEPING BUDDHA'S BARE FEET ARE LEFT BY WORSHIPERS ON THE ALTAR

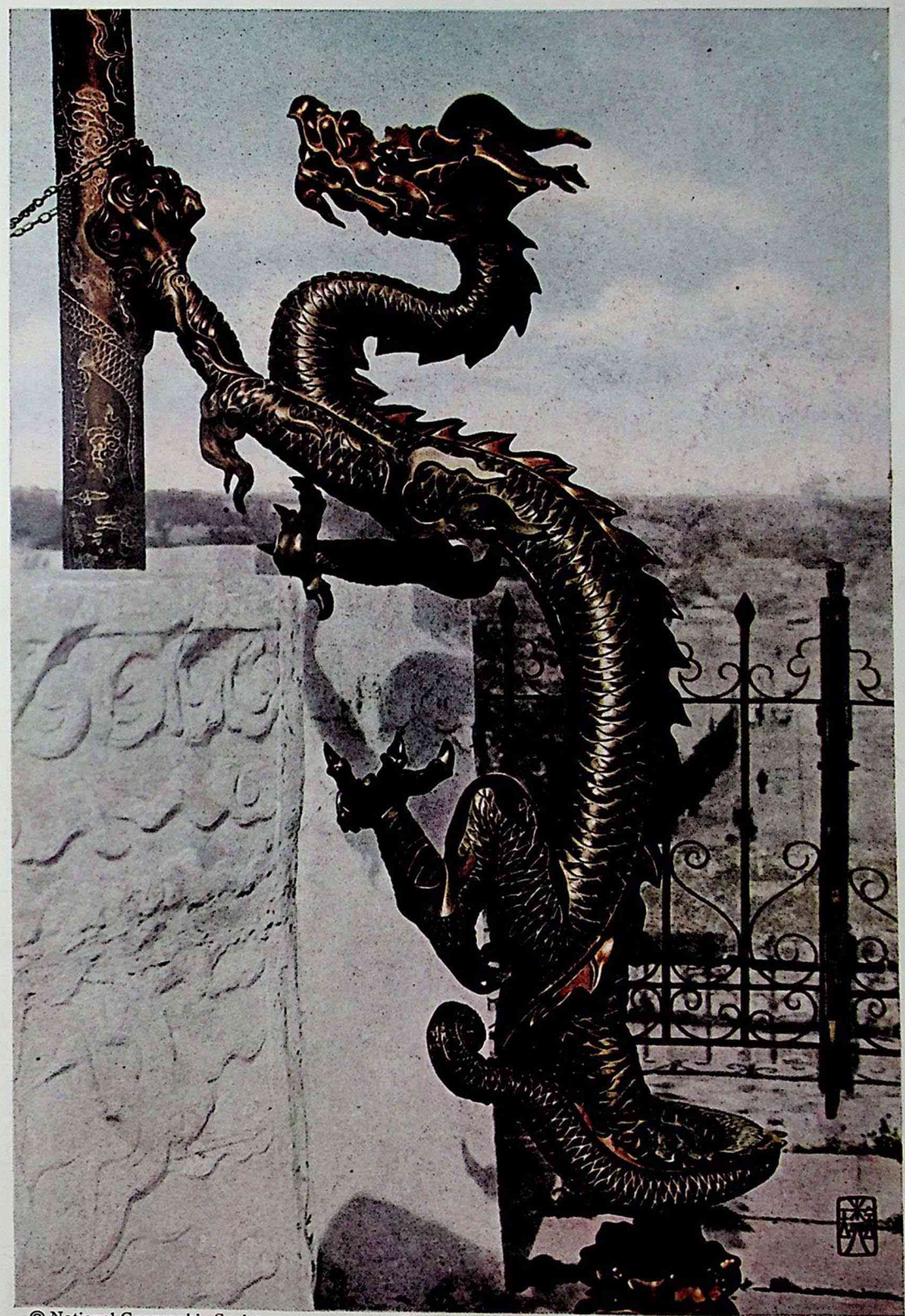
Attending deities seem to watch over the wooden figure of the Beloved One as he slumbers in rich robes of state at the ancient Wo Fo Ssu monastery in the Western Hills. Incense sticks on the altar will be burned in the vase before the sitting image.



© National Geographic Society Camera Painting by H. C. and J. H. White and Deng Bao-ling

"OLD BUDDHA'S" SUMMER HOME IS MIRRORED IN HER LILY-DOTTED LAKE

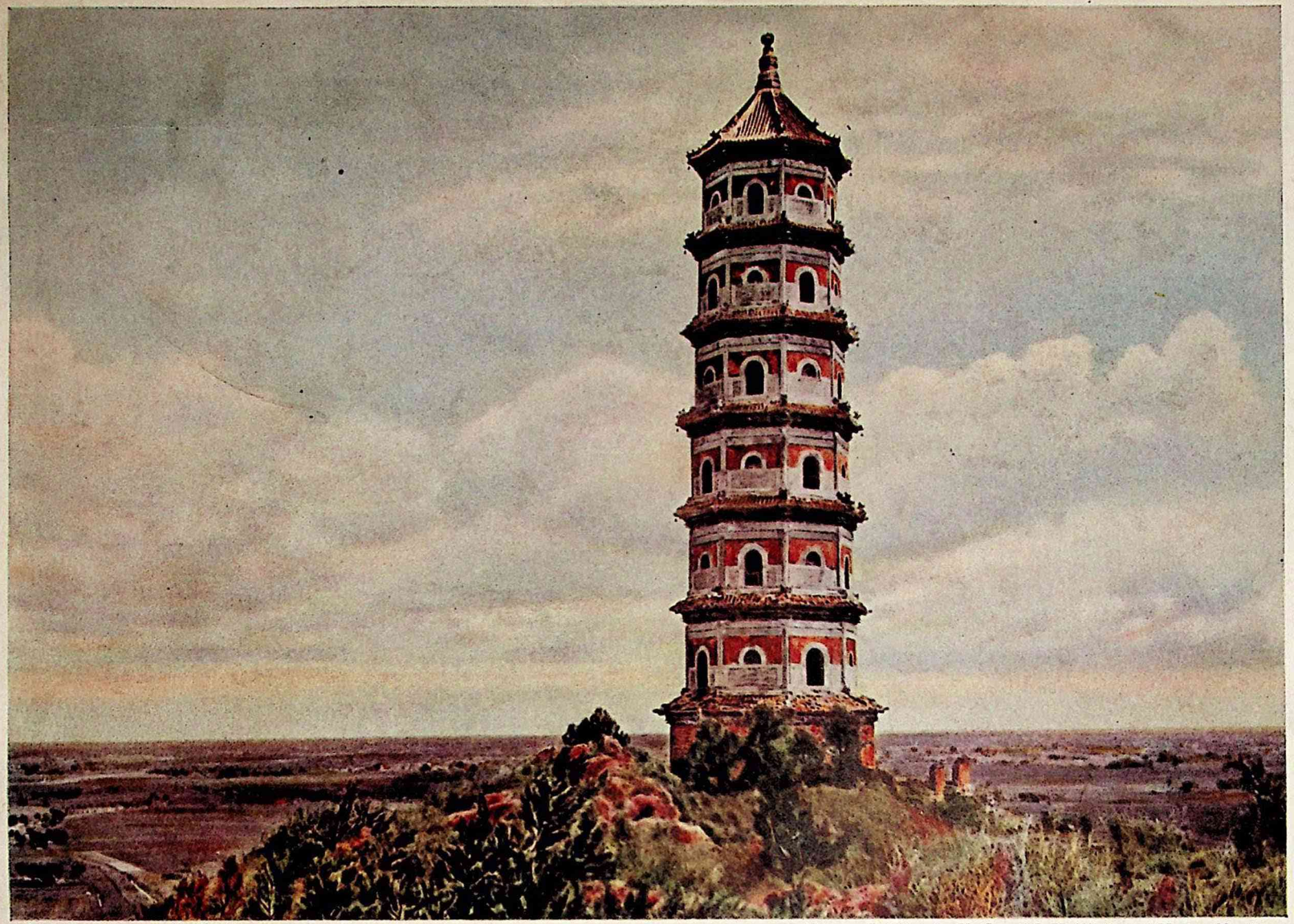
Empress Dowager Tzu Hsi used navy funds to build this "woman's $50,000,000 whim," near Peiping. Subsequently the Celestial Empire was defeated in the Chino-Japanese War of 1894-5. A motor road now brings visitors here.



© National Geographic Society Camera Painting by H. C. and J. H. White and Deng Bao-ling

THIS SCALY BRONZE DRAGON GUARDS PEIPING'S "STAR-GAZING PLATFORM"

Marco Polo's patron, Kublai Khan, built an Observatory here on the east wall about 1280. The present dragon-wreathed instruments were cast under supervision of Jesuit priests some 400 years later.



© National Geographic Society

Camera Painting by H. C. and J. H. White and Hwang Yao-tso

EMPEROR KANG HSI, CONTEMPORARY OF FRANCE'S LOUIS XIV, BUILT THIS PAGODA ON THE JADE FOUNTAIN HILL

Such buildings were often erected as memorials, as symbols of good luck, or as observation towers. Near the hunting park and the Summer Palace (Plates VIII and XII) is this centuries-old imperial pleasure ground with its sparkling spring, beloved of Chinese poets.

The nineteenth, which is the birthday of the old sage, also coincides neatly with the festival called "Meeting the Genii." On the midnight of the eighteenth, and even until the noon of the nineteenth, the devout linger in the temple hoping for a glimpse of an immortal.

Legends vary regarding who descends from the heavenly spaces into Pai Yün Kuan, but most devotees expect to see one of the Eight Immortals, above all the most active of their number, Lü Tung-pin. Others believe that the sage himself or one of the gods may put in an appearance.

THE NIGHT OF THE ROAMING GENII

The genii, however, do not float down on a multicolored cloud. Nor do the Eight Immortals carry the fan, fish-drum, fly brush, castanets, crutch, flute, lotus, or flower basket, by which emblems they are known to all in paintings and carvings of ivory and coral. Instead, they assume mortal guise, favoring those of beggars and impoverished Taoist priests.

In the faint glow of the tinted gauze lanterns, the resident priests appear more sleek and well-fed in their robes of spotless blue denim and large hats of shining black satin. The head priests are garbed in rich silk robes of blue, olive, or apple green.

But the priests from the outside are not always well fed, and the garments of some reveal tatters and patches of many hues. Beggars swarm the precincts and know too well that this is their night. Who would refuse a copper to a ragged priest or a grimy beggar who might be no other than an Immortal in disguise? (Page 773.)

Some fairs continue throughout the year, but do an especially brisk trade during the Lunar New Year.

Their dates, however, now follow the modern calendar, as listed here: Temple of the God of Earth, situated in the Chang Yi Gate district, and offering flowers, trees and pigeons, on the 3d, 13th, 23d of each month; the Flower Market, south of Hata Men (Gate), offering various household articles, on the 4th, 14th, 24th; the White Pagoda Temple, west of the Four Western Archways, on the 5th, 6th, 15th, 16th, 25th, 26th; Hu Kuo Ssu, in the West City, on the 7th, 8th, 17th, 18th, 27th, 28th; Lung Fu Ssu, a short distance to the west of the Four Eastern Archways, on the 9th, 10th, 11th, 12th, 19th, 20th, 21st, 22d, 29th, 30th, 31st, 1st, and sometimes on the 2d.

Then the schedule returns once again to the 3d and the cycle repeats itself in the order just presented.

Of the five fairs listed, all except the Flower Market are temples. This is a continuation of the old custom of shopping on certain days at temple fairs.

Any servant can tell you offhand the dates and addresses of each fair.

Since the bazaars sell about the same kinds of wares, such as household utensils, clothing, curios, rat poison, hair ornaments, toys, and so on, a visit to the largest fair at Lung Fu Ssu, or the Temple of Prosperity and Blessing, will give a general picture of the fair as an institution.

BRISK BARGAINING AT THE TEMPLE OF PROSPERITY AND BLESSING

There is scarcely a visitor or foreign resident who does not go there. Most Chinese buy things for household use, while Westerners frequently haunt the curio stalls that border the paths close to the temple gate. Here you may pick up carved stone, porcelain, lacquer boxes, cunningly wrought objects of pewter, brass, bronze, jade, coral, and crystal (page 771).

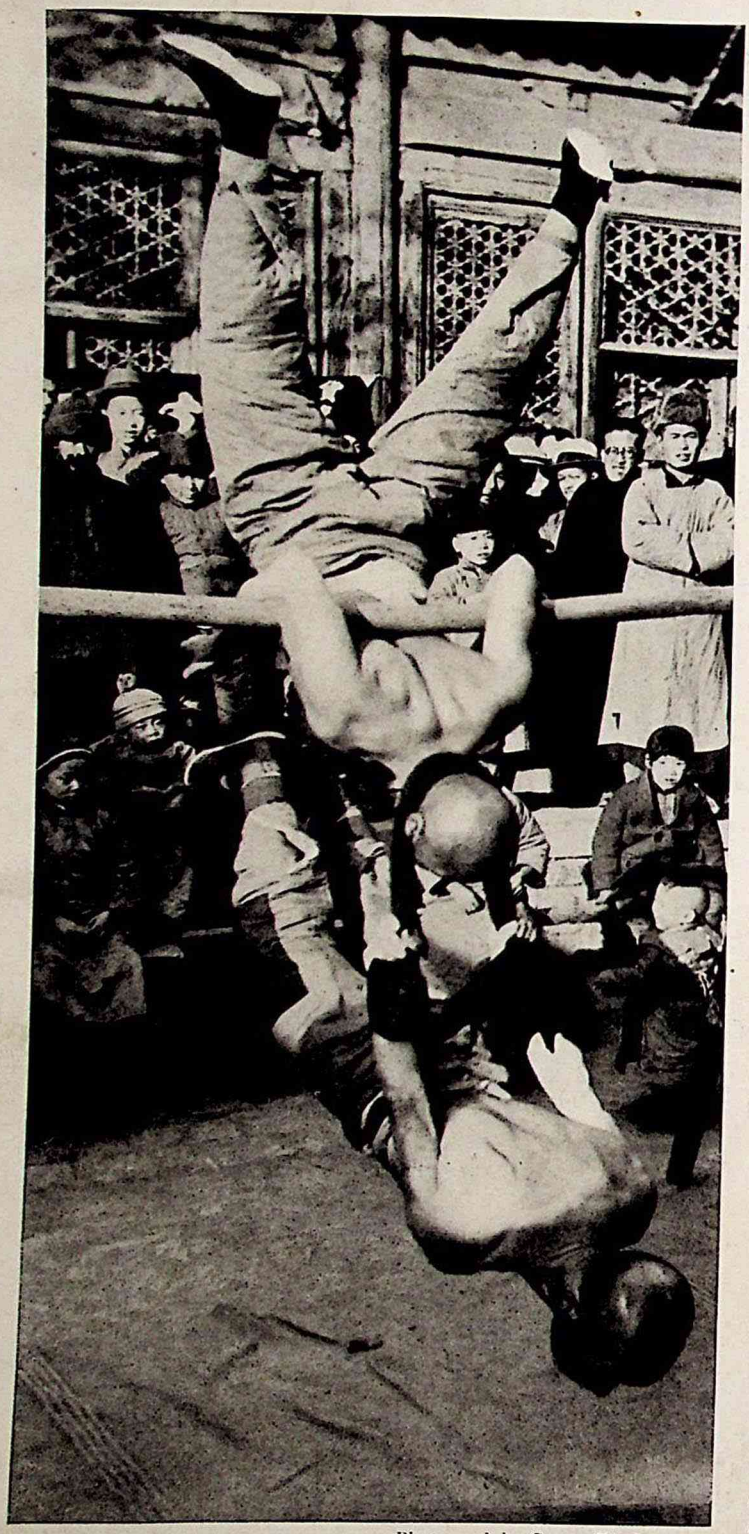
The uninitiated may triumphantly strut off with an old lacquer box having a background of dull red and a scene done in gold, after having bargained the dealer down from $10 to $2.75. The merchant heightens the buyer's sense of superior cleverness by sighing realistically that, since times are unbearably hard, he has been obliged to let the treasure box go below cost.

Although he has long ago figured out a neat profit of $2, he shows no sign of victorious satisfaction; he has merely handled competently another would-be bargain seeker.

A few steps to the north is a large variety of bamboo objects: baskets, rakes, sieves, little benches, and everything for kitchen and garden, as well as receptacles in which to wash rice, vegetables, and clothing.

Well-worn stone steps lead up to another level, the flooring of a temple hall that has vanished. The once-sacred precincts are dotted with wagons and stalls steaming with caldrons and sizzling with large iron frying pans of food. Vapors, aromatic and otherwise, assail your nostrils.

To the sides you see story tellers, acrobats, medicine men, and "wisecrackers,"



Photograph by George Kin Leung

ONE MAN'S NECK SUPPORTS THE OTHER'S FLYING TRAPEZE

Grasping the woolen scarf, the lower acrobat swings in mid-air while the muscular partner throws his legs high to keep the equilibrium. After this fair at the Temple of Prosperity and Blessing, the performers will visit another shrine.

whose concessions are clearly marked out. It is customary to designate a rectangular space for the performance. More liberal patrons sit on long, backless benches; behind stands the crowd, sometimes ten deep.

"WISECRACKERS," WRESTLERS, AND JUGGLERS

The storytellers have a stock of narratives from old novels, which they relate in spirited fashion, using facial expression, varied intonation, and gesture to delineate each character. Castanets and a drum may be used to punctuate the recitation and to add musical tempo to certain episodes. For instance, there is the rhythmic ride of the hero who, firmly seated in his saddle, lops off his adversary's head. It falls to the ground with a dull thud that is descriptively represented by a tap on the leather drum.

The "wisecrackers" have a line of patter which ranges from the literary subtleties of yore to the not infrequently bald and playful narration of risqué anecdotes.

From this courtyard to the rear, the spaces in the center of the temple are mostly occupied by outdoor entertainers, including acrobats, wrestlers, jugglers, magicians, and trick bicycle riders.

The long lanes to either side are thickly lined with stalls.

On your way out of a narrow passage in the rear, you may buy for a few coppers puppets and paper cutouts, for birds, flowers, and lucky symbols to be used for putting embroidery patterns on slippers or other objects.

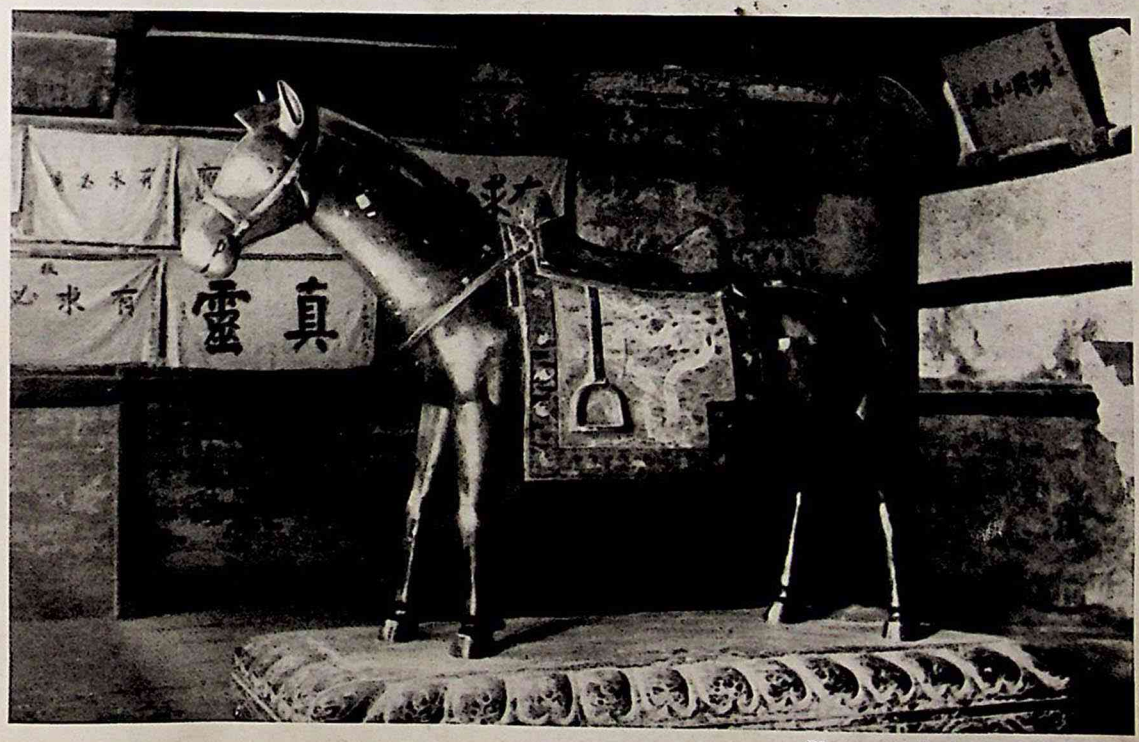
The foregoing five fairs are held throughout the year, but outstanding are two which are open during the first part of the First Moon.

Popular among curio lovers



PRAYERS RISE WITH INCENSE AROMAS IN A BUSY TEMPLE COURTYARD

A devotee lights his bundle of incense sticks from flames on the altar, while another, holding his burning offering, kneels near a round prayer mat. A new arrival (right) buys incense at the table. Opposite are stone tablets presented by various emperors to Tung Yüeh Temple.



Photographs by M. M. D. Williams

PRESCRIPTION: TO CURE ANY BODILY AILMENT, TOUCH THE CORRESPONDING PART OF THIS DONKEY'S ANATOMY

Endless pattings and caresses polish the miraculous bronze animal, in the Tung Yüeh Temple (page 765). Its eyeballs are nearly obliterated, for eye afflictions are prevalent in China. Testimonials of banners and plaques, inscribed with characters, proclaim the donkey's healing powers.



Photograph by George Kin Leung

"ALLEY OOP!"—A PERFORMER SWINGS HIGH HIS ACROBATIC CHILD AT THE BLACK TEMPLE FAIR

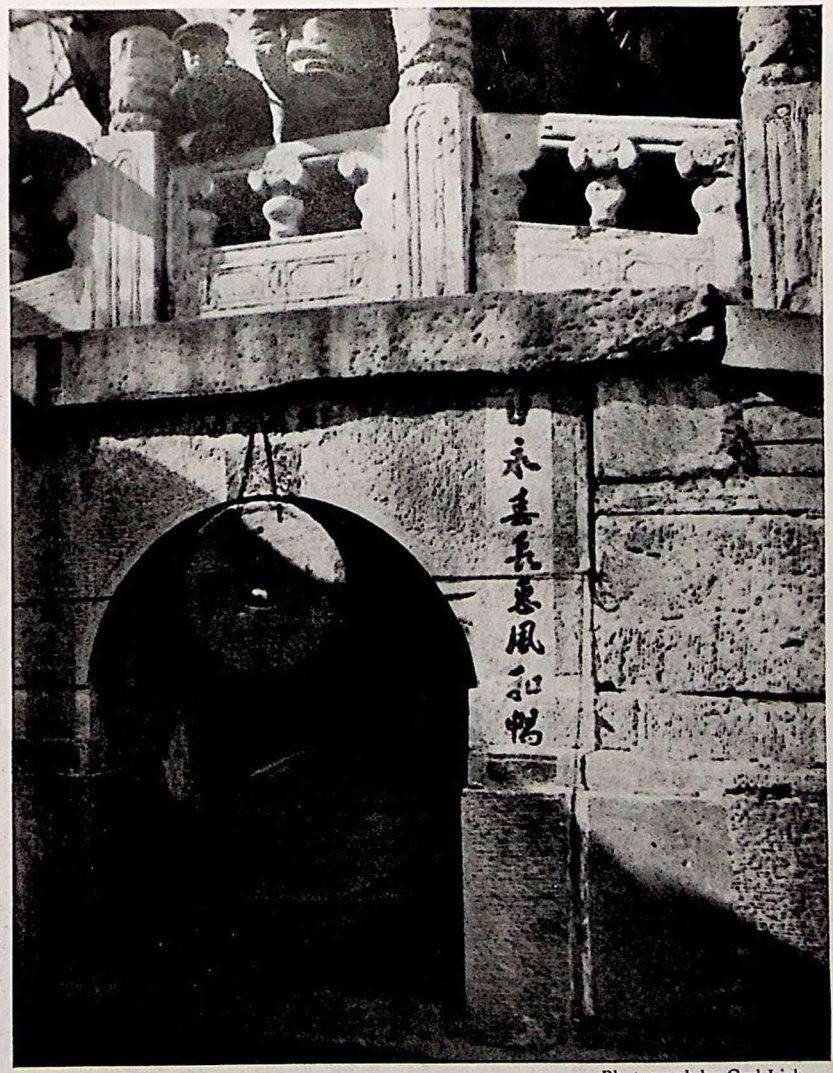
After the act, they cajole and sometimes bully the spectators into parting with their hard-earned coppers. Purse strings are not so tight as usual during the New Year holidays. These professional entertainers move with their children from fair to fair. The only stage they need is an open space marked off by a rectangle of backless benches (page 761).



Photograph by George Kin Leung

HERE'S WHY JOHNNY'S SO LONG AT THE FAIR

In one hand is a tall rod of hawthorn berries, coated with sugar. The other holds a red glass gourd. The lad will blow through it to produce a sound like *pu pu teng,* hence the gourds are known by that name. Colored glass fruit hangs on the rack above (page 791).



Photograph by Carl Lieb

PITCH A COIN, RING THE BELL, AND GET GOOD LUCK!

The shiny bell hangs in the center of the huge yellow disk called the "gold piece." Coins thrown at the "gold piece's eye" carpet the stone beneath a pit of the Bridge that Imprisons Winds (page 776). Possibly some provident priest devised this cash magnet to insure the upkeep of his beloved temple.



Photograph by George Kin Leung

"PAY NOW OR WE WON'T FINISH THE TRICK!"

With this threat, acrobats at temple fairs often extract spectators' money. Sometimes they refuse to complete a stunt unless a stipulated amount is given. The two child performers are billed as the leading man's daughters.

and those who admire hand-wrought objects is the annual bazaar held in the Temple of the God of Fire, near Liu Li Chang. It attracts large crowds from the 6th to the 15th of the First Moon.

A NOVEL PREMIUM DEVICE

The inconspicuous entrance off the narrow street is a dramatic arrangement. One hardly has stepped inside when his eyes are dazzled by displays of ivory, jades, crystal, coral, and other rarities. The courtyards within are crowded with hundreds of booths laden with curios and carvings.

The expert and veteran shopper alone may be certain of a good bargain. The experienced know that, just as there is silk *and* silk, there is jade *and* jade. Fine jade may bring thousands of dollars for a small piece, but a large chunk of low quality may fetch only a few dollars.

It is said that a few Mongol customers are never satisfied that they have a real bargain unless they succeed in pilfering a small object. Knowing this, the wily dealers place small inexpensive objects where the prospective buyer can easily slip them into his sleeve, with the result that the latter, highly delighted, may overpay for the article he wants.

Dealers in paintings are housed in the many rooms of the temple, and a few have open-air booths at the rear.

White cloth banners bearing the following Chinese characters in black ink were hung at the temple entrance: "All merchants in this bazaar sell their wares at one price"; "Strictly one price; restore good business ethics" (page 771).

A FAIR FOR BOOKS AND PAINTINGS

It read very well, but in the course of purchasing two small jade figures, I had stood scarcely a moment before the dealers began the ancient national game of talking price.

Liu Li Chang, once the site of the imperial glazed terra-cotta kilns during the dynasties, is a gigantic fair that opens for the first fifteen days of the First Moon.

Its northern end begins a bit south of the gate connecting the Tatar and Chinese Cities. There huge temporary mat sheds sell paintings and scrolls of calligraphy, while street dealers offer the same wares, hanging them on the brick walls of the thoroughfare.

The street is littered with old paper-bound books arranged on rickety tables. The walls of a small lane running east of the main highway are covered with kites of all sizes and designs. A few steps to the south one sees vistas of gaily colored cardboard windmills that clatter fitfully in the gusts of an early spring breeze, not to mention yards of candied haws and deep-red glass gourds (page 789).



Photograph by George Kin Leung

TIME OUT TO POSE

Heavy quilted trousers and jacket make the child, dressed for a holiday, seem much plumper than is really the case. The curious cap is made to resemble a cat's head, with pointed ears and grinning mouth.

South of the crossroad are endless booths of curios and porcelains, while even the small temples and formerly empty houses that have a door on this street are rented out to book and painting merchants, ten to thirty of whom may be found in one establishment.

Doomed to disappointment are the naive old scholars who innocently believe that one still can pick up rare old books at a low price. Practically all the bookstalls have been sent out by the big shops not far off.

The never-ending sea of shopworkers on vacation, students, women, children, with a sprinkling of country folk, scholars, Mongols and Tibetans in their bright, yellow or purple sheep-lined coats, high boots, and great fur hats, keeps the traffic officers extremely busy.

VAUDEVILLE IN THE BRIDGE OF HEAVEN DISTRICT

With the visits to temple fairs and bazaars from the first to the fifteenth of the First Moon completed, and the culmination of the festival at the Pai Yün Kuan



Photograph by George Kin Leung

A MEDICINE MAN "DRAWS A LONG BOW" AS A "COME-ON" FOR CUSTOMERS

Like an old-time American patent-potion salesman, he entertains the crowd before extolling his merchandise, stacked on the table. In common with most Chinese arts, the technique of drawing a bow has become highly specialized; each motion must be performed in a set way.

on the nineteenth, the active celebration of the great holiday might well end for most of us.

Yet, during the first week of the Lunar New Year, well worth visiting is the Bridge of Heaven district, just off the main road before you come to the Temples of Heaven and Agriculture.

Almost every afternoon the space to the west of the road is a lively stage for hundreds of entertainers: acrobats, jugglers, wrestlers, performing animals, singing girls, and troupes of actors (pages 786, 788, 790). Special stunts are offered to the public during the New Year season when purse strings are a bit looser than usual.

The sound of gay music and firecrackers of the Lunar Year festivities intensifies the grief of those who are hard pressed. Even the firecrackers are not an unmixed blessing, for they set shops afire every year. Those who cannot pay their debts not infrequently commit suicide rather than "lose face."

It will be interesting to observe the outcome of the Government's campaign to refashion ancient holidays, and sometimes to create new ones. Because of the innate courtesy of the Chinese people, the battle, if any, will be silent. Presumably, a few deep bows of courtesy will be exchanged and everyone will go on doing quite as he pleases.

As in the old heroic novels, he who offers the most clever ruse, preferably tempered with a good laugh, and not force, will win popular support.

HOW DULL LIFE—WITHOUT WINDMILLS!

We Chinese realize that if China is to take her rightful place in the world of today, much of the older order may ruthlessly be swept away. Yet it is sincerely hoped that not too much will be trampled under the heavy, insensitive heels of transition. Can the human mind live on the prosaic alone?

How dull, even if orderly, life would be at the New Year season without the myriad brightly colored windmills and the forests of sugared haws!

May we not strive to combine the fragile beauty of the past with the metallic strength of the present?

THE SOCIETY'S NEW MAP OF THE PACIFIC

By Gilbert Grosvenor

President, National Geographic Society

WIDEST, deepest, largest of the oceans, the vast Pacific and the colorful lands around it are portrayed in a new wall map, issued to members of the National Geographic Society with this issue of their Magazine.*

Today flying boats roar above aboriginal outrigger canoes in a spacious region, and 20th-century invention breaks down barriers of time, distance, and tradition.

The new ten-color map is ideal for Geographic readers who follow dramatic change and progress in the Pacific.

Seventy-three large-scale border insets around the central chart make this a unique "one-page atlas" supplementing The Society's recent maps of Asia, Canada, the United States, and South America to complete the picture of the Pacific hemisphere. Europe, Africa, both Polar regions, the Caribbean, and the World have already appeared in the notable series distributed to members in recent years with their National Geographic Magazine.

Pacific Exceeds World's Land Area

Stretching more than 10,000 miles from Panama to the Philippines and almost as far from Antarctica to Bering Strait, the Pacific, with twice the volume of the Atlantic, occupies about a third of the surface of the globe and more area than all its land.

Take a map of the world and imagine that the western edge of the tropical Pacific at Manila falls at San Francisco. Stretching eastward, thus transposed, the Pacific Ocean would span all the United States, the Atlantic Ocean, reach across Africa, and well into Arabia.

The Pacific is less saline than the Atlantic Ocean. It is ringed by higher and newer mountains than any other, it contains most of the world's islands, and it has a practical monopoly on earthquakes. Of all the world's volcanoes (more than 400 are listed), by far the larger number are scattered throughout the Pacific area or rumble in its "rim of fire."

The large central map, covering the Pacific area as a whole, is on the generous scale of 1:35,000,000. On Mercator's Projection, 25 inches by 20 inches, it shows the continental areas around the Pacific, including Australia, most of North America, a broad coastal strip of South America, and most of Asia. Islands appear in proper relation to continents and to one another.

Political divisions, towns and surface features, chief air routes and steamship lanes—all are here. Significant depth contours tracing the ocean floor show extent and location of the Pacific's great deeps and submarine plateaus.

A row of miniature clocks along the lower border of the main map shows the time in various sections of the Pacific region when it is midnight in Greenwich, England. White lines, leading from these clocks, bound the time areas. Districts using intermediate time are shown, each with its clock giving the local hour. Short-wave radio fans will welcome this feature.

While New Year crowds in London are welcoming Friday, January 1, 1937, New Yorkers will be gathering for Thursday dinner, their last in 1936. At the same time, San Franciscans will be busy with the midafternoon year-end trade; in Honolulu swimmers and golfers will be playing out the old year; while in Sydney, Australia, late holiday risers will straggle in to the first breakfast of the new year.

A table on the central map lists various native equivalents of English words for natural features, such as "island," "mountain," or "cape."

73 Insets Show Islands in Detail

In the 73 individual insets around the main chart, important archipelagoes and islands are "spotlighted" by accurate and detailed portrayal on enlarged scales. Tiny dots scattered over the immense ocean like stars in the heavens now are magnified to show their shape, topography, harbors, roads, and villages.

Here are Pearl Harbor and Pago Pago, United States naval bases, among the finest Pacific harbors. Insets contain tiny Wake and Midway, suddenly prominent stepping-stones on the new transpacific air route, which is indicated by a dashed red line.

Clearly portrayed are popular little islands which frequently emerge in the daily news—Nauru and Ocean, rich guano fields;

* Members wishing additional copies of the new Pacific Map may obtain them, by writing the National Geographic Society's Washington, D. C., headquarters, at 50 cents, paper (unfolded); 75 cents, mounted on linen; index, 25 cents additional.

Pitcairn, of recent movie fame; Truk, Yap, Ponape, and the other mandated islands which Japan now controls;* and South Sea isles of song and fiction, such as Tahiti, Rapa, Tongatabu, whose musical names have always been magnets to adventurers.

WHEN JAPAN WAS MEXICO'S "NEIGHBOR"

In 1513 Balboa stood "silent upon a peak in Darien," first of his race to gaze from the New World over the boundless waters of what he called the "Great South Sea." Years passed before European keel first furrowed the full breadth of the Pacific. Then Magellan, in 1520-1, fought through the stormy strait that now bears his name into the unknown "Mare Pacificum"—and heroically sailed on!

Library geographers made his maps. Drawn from reason and imagination, yet remarkable for some astute inferences, they contained other amazing surmises. They showed Japan approximately where Mexico should have been.

Drawn to this romantic sea in succeeding centuries was a glittering parade of explorers, buccaneers, whalers, and traders from every land. Captain James Cook's Pacific expeditions in the 18th century produced more knowledge than all that had gone before. He mapped the Society Islands, showed New Zealand to be two islands, and proved conclusively that Australia was not a mere peninsula of New Guinea. He sailed farther south than any previous explorer, he visited the Hawaiian group, and mapped the shores of what now is Oregon to northern Alaska. The first comprehensive map of the region was his.†

FESTOONS OF ISLANDS

The Pacific's multitudinous islands contrast strikingly with the Atlantic's insular poverty. Volcanic chains, clearly strung together in the Aleutians and along the western shores, run out in long streamers across open ocean. Diagonal deep-sea archipelagoes are strewn from the East Indies and Japan across most of the breadth of the Pacific.

Planet-shaping forces lifted the mountainous Samoas, Hawaiians, and Societies above the sea. Yet hundreds of peaks pushing up from the ocean floor just fail to reach the surface.

On submerged foundations, patient hordes of coral polyps have built the Caroline, Tuamotu, Marshall Islands—and countless more.

One of the most symmetrical volcanic islands, Niuafoō, in the Tongas, resembles a huge doughnut when seen from the air. Rising some 6,000 feet from the ocean bed to 800 feet above sea level, it is about five miles across. A large lake occupies the central crater of a still-active volcano that destroyed a village in 1929. Happy Polynesians live philosophically on their explosive patch of land, compelled, occasionally, to dodge outpouring lava.

Niuafoō lacks harbors. For years natives swam out with log floats to the mail boat, holding outgoing letters in brown paper packages tied to the tops of sticks. Mail from "outside," soldered in big biscuit tins, was dropped into the water and towed ashore. This postal service, now replaced by a tender system, has won for Niuafoō the nickname "Tin Can Island." *

Rich soil, formed from disintegrating volcanic lava, makes "verdant paradises" of Tahiti, the Samoas, and other islands of volcanic structure. Heavy rains carve jagged skylines in steep ridges. Deep-cut valleys roar with cascading streams.

The countless South Pacific coral atolls bear no resemblance to the battlements and spires of volcanic islands. Low and flat, they depend on waving coconut palms for skyline. Tiny, reef-building coral animals, living in relatively shallow water, leave myriad stony skeletons when they die. Descendants build on and upward, gradually adding their calcareous remnants to the growing pile. Ocean waves toss up coral rock and sand, which then is weathered into soil. Volcanic action often raises the coral cap of a subterranean peak far above the sea.†

Northeast of the Solomon Islands, in the western Pacific, a cluster of islands around a blue lagoon forms one of the world's largest purely coral atolls. This is Ontong Java, an isolated source of copra, which it sends to Australia, and of trochus shell,

* See "Mysterious Micronesia" (the Japanese mandated islands), by Willard Price, in THE NATIONAL GEOGRAPHIC MAGAZINE for April, 1936.

† See "The Columbus of the Pacific (Capt. Cook)," in THE NATIONAL GEOGRAPHIC MAGAZINE for January, 1927, and "The Greatest Voyage in the Annals of the Sea (Magellan)," December, 1932, both by J. R. Hildebrand.

* See "Living On a Volcano," by Thomas A. Jaggar, in THE NATIONAL GEOGRAPHIC MAGAZINE for July, 1935.

† See "Coral Castle Builders of Tropic Seas," by Roy Waldo Miner, in THE NATIONAL GEOGRAPHIC MAGAZINE for June, 1934.

which is made into "pearl" buttons in Japan or Belgium.*

"Small" coral colonies form trivial atolls, like Rakahanga. Measureless are polyp populations which have built a wall around New Caledonia, 400 miles long on one side, and the Great Barrier Reef, stretching 1,200 miles along Australia's Queensland coast.†

Chief resource of coral islands is the amazing coconut palm, one of the most useful trees in existence. It supplies food and drink; ropes and rough fabrics; timber and fuel; and its dried nut meats (copra) yield valuable oil.

NOW YOU SEE THEM—NOW YOU DON'T!

Falcon Island, touch-and-go offspring of the Tonga group, has played hide-and-seek with navigators for decades. First reported in 1865 as a breaking reef, it was found twelve years later belching smoke and steam. In 1885 it was an island, rising high above the sea. After gradually wasting away, it disappeared almost entirely in 1900 and was virtually forgotten. Born again in tremendous eruptions of 1927-28, erratic Falcon reappeared 600 feet high and two miles long. Two years later it had shrunk again by a third.

Jack-in-the-box of the North Pacific, vagrant Bogoslof Island in the Aleutians not only alters shape but shifts from place to place. It has also appeared now as one island, then as two, in obedience to capricious undersea volcanic force.

Between A.D. 416 and 1867, Japan recorded more than 2,000 earthquakes. With invention of the seismograph, records skyrocketed. In 19 years, 27,485 were counted, an average of about four a day!

The world's greatest elevation differences occur in the Pacific. Within sixty miles, the slopes of the island of Hawaii rise from the ocean floor, 18,000 feet below the surface, to the cloud-capped peak of Mauna Kea, 13,825 feet above the sea, or almost 32,000 feet from the true base of the mountain. Mauna Kea is the highest island mountain in the world.‡

Within a somewhat greater lateral distance, about 240 miles, on the coast of Chile, land rises from the 25,000-foot abyss of the Atacama Trench to the snowy summit of Luillaillaco, 22,057 feet above sea level—a lift of nearly nine miles.

THE OCEAN'S GREATEST DEEP

The world's profoundest deep measures 35,400 feet from sunny surface to cold, lightless bottom east of Mindanao, in the Philippines. Mount Everest, removed to this pit, would form no island, for its peak would be under more than 5,000 feet of water. Other trenches from 23,000 to 31,000 feet lie in the western Pacific.

Contrasting with the western Pacific, broken up with abyssal deeps and high mountains, the ocean floor east of the Hawaiians is a vast, monotonous plain, with an average depth of about 16,000 feet.

Relics of ancient cultures abound in the Pacific. Tantalizing evidence exists of prodigious feats by vanished tribes in navigation, construction, and social organization. Puzzling it is that civilized societies perished while savage peoples lived on.

Best known Pacific monuments of prehistoric days are the more than 600 huge, expressionless, half-length human figures in stone, left standing and fallen on Easter Island, mysterious, unexplained.*

But the "Venice of the Pacific" at Nanmatal, on Ponape, the great ruins on Lele Island, the temple on Malden, New Caledonia's irrigation terraces, the megalithic monuments and curious stone carvings and other hundreds of less spectacular antiquities are all essential pieces in the Pacific's archeological jig-saw puzzle.

Courageous long-distance voyagers were the early Polynesians, masters of primitive navigation arts. Skillfully reading currents, winds, and stars, they visited distant islands, sailed safely home. Polynesians were guided to New Zealand, tradition says, by migrations of birds from those islands to Japan. The Marshall Islanders' charts of lashed reeds show prevailing winds, currents, and islands.

History's early Antarctic explorer, Huite-rangiora, returning from a long southward voyage in the seventh century, reported a foggy, dark place, far beyond Rapa, where sunless seas were frozen white like scraped arrowroot.

The natives of Yap use massive stone disks for money. The largest, twelve feet

* See "Coconuts and Coral Islands," by H. Ian Hogbin, in THE NATIONAL GEOGRAPHIC MAGAZINE for March, 1934.

† See "The Great Barrier Reef and Its Isles," by Charles Barrett, in THE NATIONAL GEOGRAPHIC MAGAZINE for September, 1930.

‡ See "Hawaiian Islands," by Gilbert Grosvenor, in THE NATIONAL GEOGRAPHIC, February, 1924.

* See "The Mystery of Easter Island," by Mrs. Scoresby Routledge, December, 1921.

across, weigh tons. Not all their currency is so cumbersome. Comparatively portable "small change" is only two or three feet in diameter! This cash was brought chiefly from Palau Island quarries, nearly 300 miles away over open seas.*

Solomon Islanders still build graceful canoes from light boards, carefully carved and matched. Holes through small knobs left inside the hand-hewn planks permit a boatbuilder to lace his whole craft together. Thirty or forty husky paddlers drive these 40- or 50-foot canoes at the speed of engined hulls. Even longer boats once were used.

Savages commute by boat from Auki Island to Malaita, in the Solomons. Auki is an artificial islet haven built by coastal natives fearful of interior savages. Here a mint is located, where the shell money of the Solomon Islands is made. In other larger Melanesian islands salt-water dwellers, semicivilized, still must thwart savage raids of backwoods cousins.

Last year the United States established Government stations at Baker, Howland, and Jarvis Islands. These lonely bits of land, pin-points on maps, have potential value as supply and fuel bases for a possible air route from the United States to Australia and New Zealand. None of the three coral humps is more than a mile or two square. Jarvis, the largest, is practically in the center of the Pacific.

Idyllic Lord Howe Island, a fragment of land in the Tasman Sea, supports a utopian life based on a practical monopoly of the native Howea palm. Most of the world's potted palms are grown from its exported seeds. The trade in palm seeds maintains about 150 permanent residents of British stock. Because kindly Nature tends the wild-growing trees, islanders need work an average of only two hours a week! †

On lonely Guadalupe Island, off Baja California, Mexican soldiers guard remnants of native elephant seal herds. Sought by hunters and collectors, the once plentiful animals face the extinction already meted out to the Guadalupe fur seal. Goats, cats, and mice, introduced on this desert island, have almost stripped it of unique flora and fauna. Because the cats seem to prefer birds to mice, traditional barnyard enemies live side by side, watchfully but in peace.*

All the islands which will fall under the shadow of the eclipse of June 8, 1937, are shown: Nukufetau, Funafuti, Vaitupu, Gardner, Canton, Birnie, Enderbury, Fanning, and Christmas. Some of these will attain fleeting fame as bases for important astronomical expeditions.

Cocos Island, 300 miles off Costa Rica, has been the goal of treasure hunters for a century. Buccaneers, plundering along the Central and South American coasts in the 17th and 18th centuries, are alleged to have buried the spoils of their raids here.

Greatest lure is the "Loot of Lima." Fearing seizure of the fabulous wealth of gold, silver, and gems stored in Lima Cathedral, city fathers of the Peruvian capital placed the treasures on a ship, which was taken over by pirates. The crew was captured later, but not until the rich cargo had been buried, presumably on Cocos, and many "treasure hunts" are staged there.

OLD IN GEOLOGY, NEWEST IN HISTORY

Old geologically, the Pacific is newest historically, in world politics and commerce.

A century ago some statesmen ridiculed the idea that our Pacific coast would ever be of value to the United States.

In less than a hundred years a network of events, shuttling back and forth across its vast expanse, has brought it into the forefront of present-day affairs.

In 1848 gold was discovered in California. Three years later Australia experienced a gold rush. In 1854 Japan began to open her doors to the world. In 1869 our first transcontinental railway pushed through to the Pacific coast. In 1896 gold was discovered in the Klondike. The Philippines and Hawaii were acquired by the United States; the Philippines recently were relinquished. The Panama Canal was opened.

Steamships are plying many new paths with ever-increasing cargoes and passenger lists. Now airplanes fly scheduled routes. Thus the Pacific is a new world stage of naval strategy, statesmanship, and trade.

* See, in THE NATIONAL GEOGRAPHIC MAGAZINE, "Romance of Science in Polynesia," by Robert Cushman Murphy, October, 1925; "Islands of the Pacific," by J. P. Thomson, and other articles on Nauru, Yap, etc., December, 1921.

† See "Paradise of the Tasman," by Hubert Lyman Clark, in THE NATIONAL GEOGRAPHIC MAGAZINE for July, 1935.

* See "A Cruise Among Desert Islands," by G. Dallas Hanna and A. W. Anthony, in THE NATIONAL GEOGRAPHIC MAGAZINE for July, 1923.